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IMPROVED FORM OF COAL RAILROAD.

Our engraving represents a new form of coal railroad used for transporting the fuel from the boat and depositing it at desired points within the yard. The chief peculiarity of the invention consists in the utilization of the momentum of the car when filled, acquired by descending an inclined plane, to return the car, when emptied, back to the place whence it started.

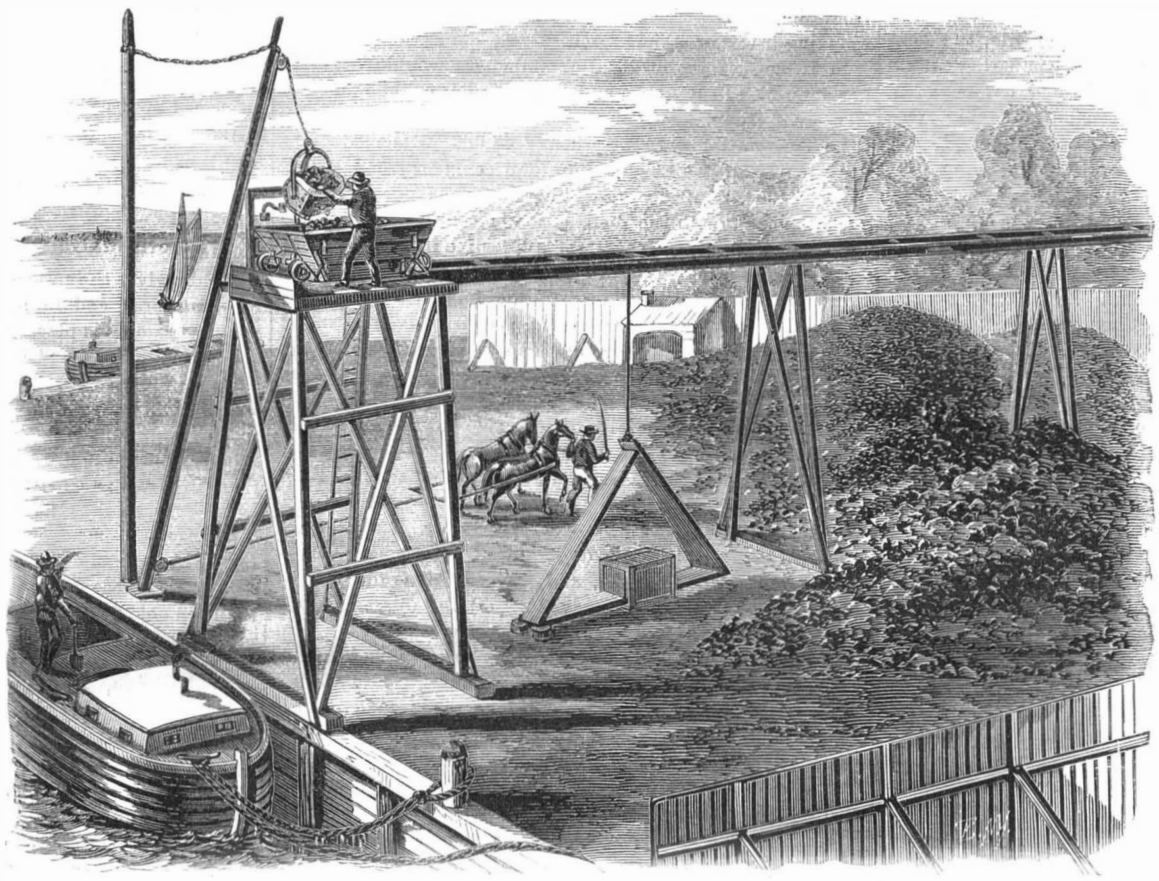
As will be seen from the illustration, the coal is hoisted from the boat in buckets by means of an ordinary derrick. For this work horse power may be employed, or, what is more convenient, a small hoisting engine. The car, which rests on a scale platform at the end of the railroad, is, by this means, easily filled, but one man being required to empty the buckets as fast as they are elevated. As soon as the scale beam, previously weighted, indicates that a certain quantity of coal, one or two tuns for instance, is contained in the car, the latter is ready to start on its journey to deposit its load. The lower portions of the sides of the car are so arranged as to be held closed while the process of filling is going on, but on the arrival of the car at the point at which it is to discharge its contents, a projection on the side of the track strikes a lever which, acting on the mechanism, causes the sides to swing open, so allowing the coal to fall out. This projection is a block of wood moving in a groove on the side of the railway, which can be placed at any locality at which it is desired to drop the contents of the car.

The automatic arrangement which causes the empty carriage to return consists of an endless wire rope, which is first attached to the framework of a small wheel which travels on a rail underneath the main track. The rope then passes over a sheave at the loading end of the road, thence through openings underneath the car, the latter working freely upon it, thence over another sheave at the further end of the railway, and, finally, back underneath the track, until it is attached to the opposite side of the framework of the wheel first mentioned. To the axle of the latter is fastened, by means of hinged rods, the triangle of planks, shown in the engraving, to the lower side of which a heavy weight is applied.

The car, having received its load, is started by a slight push down the inclined track. It travels on until it strikes a metal block, which is immovably fastened to the endless wire rope. This block the car carries on with it, causing a strain to be applied to the rope which, passing over the sheave at the starting point, is communicated to the wheel under the track. The latter, yielding to the pull, travels along its rail, causing the triangle attached to it to tilt until the side on which the weight is fastened is raised to a nearly vertical position, the apparatus being prevented from being moved bodily by the hingeing of its forward angle to the ground. The car, meanwhile, continues its motion until the lever, holding its sides closed, strikes the projection before referred to. The coal is then allowed to drop out, and the moment the car is freed therefrom, the heavy weight on the triangle begins to fall. The latter, though overbalanced by the loaded car, is much heavier than the vehicle when empty, so that, in seeking to return to its original position, it moves the traveling wheel to which it is attached; this communicates motion to the endless rope, which starts the car on its backward journey. As soon as the weight reaches the ground, the pulling strain on the car ceases, but the acquired momentum of the latter is sufficient to carry it back to its original starting point.

It will be seen that the arrangement of the weight is such that, when the car strikes against the block on the rope, the strain is made to act gradually, so that by the time the car is ready to discharge, its inertia is nearly overcome. The advantage of this is the avoidance of the great wear upon the moving parts incident to sudden stoppages or changes of motion. The apparatus accomplishes its work with great celerity and is easily attended by a single man, who has only to empty the buckets, as they are hoisted, and start the car when filled

Trials made in our presence proved that a loaded car can travel a distance of 175 feet, discharge its contents, and return in the space of thirty seconds. The economy and comparatively small cost of this invention will recommend it to all practical men. It can be easily erected in any coal yard; it has no confusion of ropes, no switches or turn-outs, requires but a single track, and when compared with the more complicated arrangements now in use or with the old mode of transporting coal in wheelbarrows from point to point, cannot but result in a large saving of time and expense.

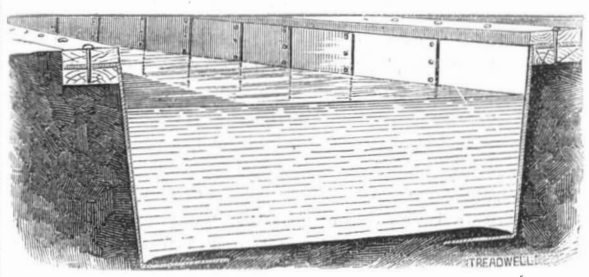


HUNT'S IMPROVED COAL RAILROAD.

Mr. C. W. Hunt, of West New Brighton, Staten Island, is the inventor, from whom any further information may be obtained, or the railroad itself may be seen in operation at his coal yard in the abovementioned village.

DOANE'S IMPROVED CANAL CONSTRUCTION.

William H. Doane, of Cincinnati, Ohio, has patented an invention which consists in applying to the banks and bottoms of canals a lining composed of smooth plates of sheet metal riveted together so as to prevent the passage of water between their joints, the upper edges being clamped between two stout sills or string pieces, by which arrangement the lining is secured in its proper position, and its upper portions protected from injury. It is preferred that these plates should



be long enough to extend from the top to the bottom of the embankments. In order that the upper portions of these plates may not be injured by the horses' feet, or otherwise, they are bent down to a horizontal position, and then securely confined between two longitudinal sills or stringers, which latter are united by spikes or bolts, as shown in our engraving. The lower portions of these plates may also be attached to sills, if preferred; or they may extend a suitable distance below the bed of the canal and be maintained in their proper position by the earth.

In some places it may be desirable to extend the lining completely across the bottom of the canal. The lining plates may be composed of copper, galvanized iron, or any other suitable sheet metal. This lining will not only preserve the banks from being washed by the passage of boats through the canal, but it will also prevent the percolation of minute streams of water through the earth, which are the well known cause of the most disastrous breaks. It will effectually prevent muskrats and other vermin from burrowing through and injuring the banks.

A canal provided with this improved lining would be especially adapted for steam navigation, and boats could be propelled in it at the highest speed without injuring the banks in the least; indeed, the more active the use of such canal, the better condition it would be in.

The lap of the joints should be in the direction of the flow, as such an arrangement will prevent eddies, and by inducing a more rapid current there will be less opportunity for sediment to deposit in the canal.

A patent has been granted to the inventor for lining the sides of a canal with metal plates united by rivets, and whose upper portions are secured between, and protected by, sills, as described. The only objection to the employment of such plates would be their first cost and the expense of replacing them, which would be at least partially balanced by the reduction of such repairs as are constantly required on canals with unprotected earth banks.

Railway Progress.

From the "Manual of the Railroad of the United States," for 1872–3—a useful volume issued by H. V. Poor & Co., 68 Broadway, in this city—we obtain the following statistics relative to the railroads of the country:

The United States now contain 60,852 miles of railway—nearly double as many as in 1860. The largest number of miles built in any one year was in that just passed, in which 7,453 miles were opened. The greatest mileage is in Illinois, reaching 5,904; the smallest in Rhode Island, 136. The State of Massachusetts has one mile of railroad to 4·86 miles of territory, this ratio being the greatest in the country.

The longest road in operation is the Chicago and Northwestern, extending 1,500 miles; the shortest, the Little Saw Mill Run Road in Pennsylvania, which is but three miles in length. The total cost of the railways in the country is $3,000,000,000, or an average of $50,000 per mile. The earnings for the past year amount to $454,969,000, or $7,500 per mile. The largest net earnings made on any road were gained by the New York Central and Hudson River, $8,260,827; the smallest on the Portland and Oxford Central in Maine and three others, all of which not only earned nothing but incurred a loss.

Hay Ventilator.

This consists of a wrought iron tube, about three inches in diameter, which is long enough to reach into the middle of the stack, and, like the Norton well tube, is provided with a conical point at the tip, and pierced for about two thirds its length with numerous holes. A screw arrangement is affixed to the posterior extremity, by which it can be connected with an accompanying discharge pipe.

For use, this apparatus is to be driven horizontally into the stack to be investigated, either by means of a mallet or by a screw arrangement, and the temperature ascertained after a short interval by introducing a self registering thermometer. Should the temperature be too high at any point in the stack, a tin tube is to be affixed vertically to the outer end of the iron tube, and an outward current of air from the interior of the stack produced, by means of which the heat is speedily carried off without any injury to the stack. Hooks may be attached to the tip of the instrument, by which small samples of the central part of the stack can be brought out.

DESTROYING CATERPILLARS.—According to Schmidt, an excellent remedy against caterpillars consists in a dilute solution (1 part in 500) of sulphide of potassium, the infested tree being sprinkled with this substance by means of a small hand syringe. This method has been used on a large scale in France, and, it is said, without any injury to vegetation,

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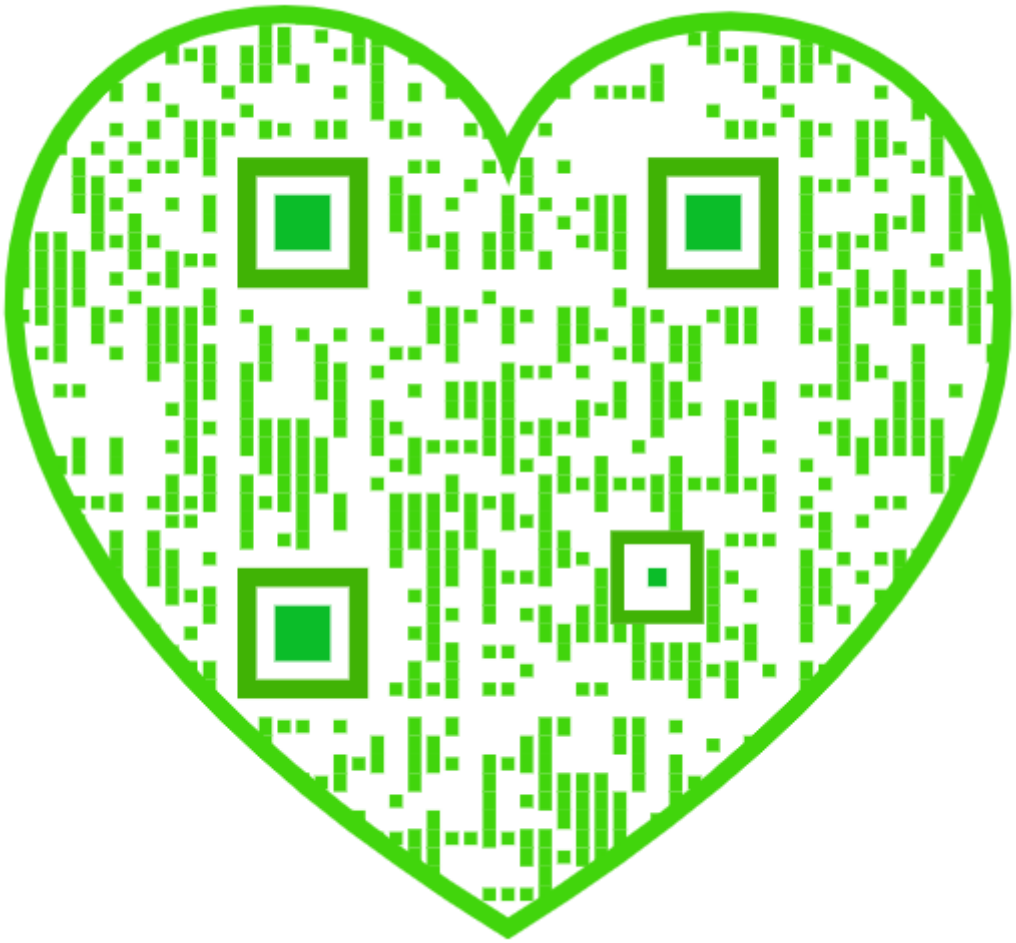

DOMESTIC MOTORS.

M. Soulié has, in a recent paper, discussed the merits of various motive forces in relation to the above subject. He mentions the following:—Springs, electricity, heated air, compressed and rarefied air, water, and steam. Each of these may be briefly discussed.

Springs are sometimes applied in the working of sewing and other machines. They are a case of transformation of force, rather than a source of it. The spring, theoretically, gives out the work that was spent on it in winding up. But there is always a loss, and they return only 0·60 to 0·80 of the work at first expended. Suppose a steel spring, 1 kilogramme in weight, (=2¼ lbs) can store up 12 kilogrammeters (=26½ lbs. moved 3 feet) it will only be possible to utilize 7·20 of these, or about 16 lbs. The application of springs must thus be very limited. They are, further, inconvenient, inasmuch as they call for frequent winding up, and breakage is apt to take place. They are also fitted with a fly as regulator. This acts by destroying the excess of work, through resistance of the air against its arms, the resistance increasing with the square of the velocity. It ceases to act, or acts feebly, when the speed becomes low, and in this differs from the fly wheel of a steam engine, which then gives back the force previously stored in it. Now in a spring driven sewing machine, for example, the action of a regulator is very much needed as the speed diminishes.

Electricity.—The electromagnetic force is to be objected to for its cost, and for the small quantity of force produced in proportion to the apparatus. The force of a motor is heat transformed into work. In the case of the pile, the heat arises from the dissolution of zinc. Now, comparing carbon with zinc: one gramme of carbon, combining with oxygen, developes 8 calories. One gramme of zinc dissolving gives only 0·55 calories. Hence 14·5 grammes of zinc must be dissolved, to develop 8 calories, and be the equivalent of 1 gramme of carbon. The price of zinc is, at lowest, $108 and that of coal $7, or 15·4 times less. If the cost of acid is further taken into account, it is found that one calorie developed by the action of acid on zinc costs 223 times as much as one from direct combustion of coal. Zinc is not found in a natural state like coal, but requires the expenditure of fuel and other outlay in its preparation. Thus the direct use of coal is more economical.

We have referred to the transformation of electricity into work; there is the opposite case of work transformed into electricity. This is done, and with the best results. Magneto electric machines, driven by steam engines, supply a brilliant light to many of our lighthouses.

Electricity as a motive force is rather capricious in its action. The battery requires considerable attention, and acids are a source of danger in inexperienced hands.

Heated air.—This is sometimes used, the ordinary coal gas being the source of heat. The large and extended distribution of gas in towns, and the power of consumption only when wanted in the motor, are advantages. On the other hand, the cost—say 40 cents per horse power per hour—must limit its use to a small production of force.

Supposing 2 cubic meters of gas per horse power per hour to be consumed in the gas motor, each cubic meter representing a calorific power of 6,000 calories. This consumption would represent a theoretical force of 1,320 000 kilogrammeters (per horse power per hour). Practically it represents only 270,000 kilogrammeters. Hence, the proportion of actual to theoretical work is $\frac{270,000}{1,320,000}$ or 0·004.

Now in a steam engine, consuming 1 kilogramme of coal per horse power per hour (each of these representing 85 000 calories), it may be shown that the work corresponding to a calorie is 32 kilogrammeters, as against 22·5 kilogrammeters in the other case. And the utilization of heat in the gas engine does not compensate for this difference.

In motors with gas heated air, the pressure in the cylinder falls immediately on explosion, though this may be remedied somewhat by introducing a little water with the gas and air. Then the heating of the cylinder necessitates the application of a current of cold water to abstract the heat, which would otherwise make the action of the piston impossible. The apparatus is thus apt to be complicated, and it requires constant care. Carbon and sulphuric acid are, moreover, deposited in the cylinder—the latter from the sulphuretted hydrogen contained in the gas. The gas is apt to escape and vitiate the atmosphere; so much so, perhaps, as to become explosive. All these are objectionable features.

Compressed Air.—This may rather be called a mode of transforming motive force, as mechanical work has to be done in compression. The use of this kind of motor has hitherto been chiefly in such works as tunneling, bridge making and mining. In the works at Bardonnecha, connected with the Mont Cenis tunnel, a column of water by its descent caused air to be compressed into a reservoir, from which it was used at will. In expanding, the air should, theoretically, give back the work done in compression. In reality, it returns only part of it. These are theoretical figures, but they show the necessity of cooling the compressing apparatus.

The distribution of compressed air, as motive force, in a city would be an expensive thing, requiring a powerful engine, reservoir, pipes, etc. M. M. Biez some time ago projected the supply of Paris in this way, upon the following data:

Works producing 945 horse power effective force, from 19,917,200 cubic meters of air compressed to 6 atmospheres by steam engines of 2,450 horse power in all, would cost two million four hundred thousand dollars. Allowing for loss through leakage, there would be 782 horse power remaining

The net cost of the compressed air would be $·00116; and its selling price might be 2 cents to 3·6 cents per cubic meter. The expense per horse power per hour in consumption would be 15·16 cents.

Such a plan, if it could be carried out, would present many advantages. The consumption could be easily measured; the force would be an intermittent one; escape of air, instead of being hurtful, would be a benefit in ill ventilated places; and there would be no delicate apparatus to manage, as in the case of electric batteries.

Rarefied Air.—M. Bourdon has invented a motor working on this principle, the rarefaction being caused by the flow of water in pipes. It is also adapted for compressed air. The maximum pressure at disposal being that of the atmosphere, it would require a large volume of air to produce a given force, and the direct use of air would seem to be more economical.

Water Pressure.—In many towns there is a large distribution of water, the pressure of which depends on the motor furnishing the supply, and the difference of level between the extremities of the distributing pipes.

In some cases the water is not carried to the different floors of dwelling houses; and in some its use for industrial purposes is forbidden. The pressure in some parts of Paris is 70 to 80 meters (227 to 260 ft.), in others not more than 7 or 8, or 22 to 26 ft.

High prices are paid. For a quantity not above 20 meters daily, the price is $8 per cubic meter per annum for water from the Ourcq; $16 per cubic meter per annum for water from the Seine. For a quantity over 20 meters, the corresponding prices are $5 and $11.

In Lyons, a force of 20 kilogrammeters would cost $247 per annum. In Roubaix and Tourcoing, it could be had at 75 cents per day.

In London, water at a pressure of 45 meters is paid for at a rate of 4d. for 1,000 gallons (or 8 cents for 4,543 liters). This is $12 or 12 cents per horse power per hour. In some towns, though the distribution is large, the pressure is small; and in others the system is defective in both respects. In most cases a reduction in price would be necessary, before the water could be used in dwelling houses as a motive force. From many points of view, it offers advantages. It is a safe force to deal with, and is not injurious to health. It can be easily manipulated, and when the water has done its work, it can be utilized for other purposes.

Steam.—This is generally inapplicable for the purpose in view. There are two sources of danger in use—the presence of fire, and of confined elastic fluid. In the hands of inexperienced or careless people, these are apt to lead to accidents. It may be stated, however, that Mr. Fontaine has constructed a small species of steam engine for house use—the steam generated by gas, and giving various forces from 6 kilogrammeters (13½ lbs. moved 3 feet) upwards. It is said to be convenient and safe.

We have thus passed under review the various kinds of force utilizable for small industries; and it would appear, on the whole, that preference should be given to hydraulic force, which may be made good use of in this way, if the expense of obtaining water be somewhat lessened and the manner of its distribution improved. Further experiment is also desirable on the employment of compressed air, the capabilities of which do not appear, as yet, to have been exhausted.

Salt Manufacture in England.

An interesting notice under this heading is given in a recent number of the *Birmingham Daily Post*. The manufacture in Worcestershire is confined to Droitwich and Stoke Prior, a parish near that town, the chief establishments being that of Mr. Corbett at the latter, and of the Droitwich Salt Company at the former place. The sources of the product are the underlying beds of rock salt, and the brine springs from which the salt is extracted are formed by the percolation of water becoming saturated with salt from the rock.

The processes of manufacture are simple. The springs are reached by wells, lined with iron cylinders to prevent the intrusion of fresh water, in which the brine rises to within 30 feet of the surface, and whence it is pumped, night and day, with undiminished supply, at the rate of some ten or twelve thousand gallons per hour. The brine, containing from 26 to 30 per cent of solid matter, is pumped into reservoirs called "tuns," from which it is conducted through pipes to the evaporating pans, which consist of enormous constructions of riveted iron plates, with flues underneath for conveying the heat from the fires kept up for that purpose. As the water evaporates the salt rises to the surface in flakes, and then falls to the bottom of the pan, whence it is, at regular intervals, removed for drying. The salt is raked from the bottom of the pan and flung into lorries, which run upon metal rails by the side of the pan. These lorries, when full, are run to the stores, where they are tipped on to the floor about 20 feet beneath.

Some idea of the extent of the manufacture may be gathered from the following facts: The works at Stoke cover an area of 22 acres, with constant extensions, and represent a capital of more than £400,000. A reservoir is in course of excavation, to hold 4,000,000 gallons of brine; there are thirty-four evaporating pans, most of them 135 feet long by 25 feet broad; and there is storage for between seventy and eighty tuns of salt. The full weekly production at the two establishments named is six thousand tuns. There are three kinds of salt made, the difference in quality consisting chiefly of the difference of the size of the salt crystals, caused by the variations in the duration of the process of evaporation and precipitation: 1. "Butter salt" so called from its general use in curing butter, etc. 2. "Table salt," which is butter salt made into molds and, 3d, "Broad salt," of a coarser grain, and used largely for the manuring of land. In the "butter salt" pans the brine is heated to 212° Fah., the evaporation being rapid, but the "broad salt" brine is only heated to 180°. The "butter salt" is drawn several times each "shift," the broad salt only every other day.

Salt is molded into blocks for domestic use, by filling the salt boxes, called "tubs," fitted with perforated bottoms, which are set down to drain; when the salt is sufficiently consolidated, each tub is taken up, turned over, and brought down sharply on a wooden stool, to free the tub from the salt, and the block of salt, after being trimmed on the edges, is taken to the drying stove. This stove is a room about 180 feet long, 50 feet broad, and 40 feet high, the floor of which is traversed by iron flues nearly a yard in hight. The blocks are first placed on small raised platforms called "cat paths," by the side of the flues, and when partially dried, are placed on the flues themselves until the process is completed.

Both at Droitwich and at St ke Prior, the proprietors manufacture their own vans, which are of iron, and cost about $400 each, as the railway companies decline to supply them on account of the action of the salt upon the iron. Each firm has, therefore, iron works, and employs several hundreds of these vans, the making of which, and the constant repairs required, keep the works in continual activity.

Mr. Corbett is the patentee of a new mode of preparing salt of superior fineness and hardness. By this method the pan is covered, and inside it are a number of rakes, made to revolve by steam power; the agitation of the brine and the greater heat caused by the retention of the steam combine to produce a more rapid deposition of salt, the crystals of which are consequently very fine and hard. The Stoke works being isolated from any town, Mr. Corbett has provided nearly 150 cottages, which are rented at moderate rates by his workpeople. There are also new and old school rooms, a master's house, and a dispensary.

Determination of Mercury in its Ores.

Eschka gives the following method as applicable to cinnabars, fahl ores, and in general all ores of mercury. The weighed sample is placed in a porcelain crucible whose edges are perfectly true and smooth. Half the weight of pure, clean iron filings, perfectly free from grease, must be added, and well mixed with the ore by careful stirring with a glass rod. The whole is then covered over with a layer of iron filings, from 0·5 to 1 centimeter in depth. The crucible is then fitted with a concave gold cover with perfectly true and even edges, so as to fit exactly, and carefully tared. The concavity of this cover or lid is next filled with distilled water. The crucible is then heated for ten minutes, by means of a flame whose point plays round its bottom. After this time the gold cover is taken off, the water poured away, the mercury adhering to the convex side is washed with alcohol to remove any bituminous matter, the lid is dried in a water bath and weighed when quite cold. The increase of weight gives the amount of mercury in the sample token.

The weighing is performed on a porcelain crucible, which in each case was weighed also. When the operation is complete, the lid is heated, at first gently and then strongly, till all the mercury is driven off. The weight of the lid and its support is found to have sustained only a very slight alteration. The edges of the crucible and the lid must fit exactly, or some of the mercurial vapor may escape. The concavity of the upper side of the gold lid must be large enough to hold a sufficiency of water to ensure the condensation of the vapors.

In rich ores, the quantity of mercury is so considerable that a semi-fluid amalgam of gold may be formed on the convex side of the lid, and when it is taken off, this may run in a drop from side to side. In such cases, care must be taken that nothing is lost; and in washing the amalgam with alcohol, the washings are collected, and any minute globules of mercury or amalgam are cautiously transferred to the concavity of the lid, so that they may be dried and weighed with the rest.

In poor ores, containing 1 per cent or under, the quantity taken for analysis should be 10 grammes; in those ranging from 1 to 10 per cent, 5 grammes; in from 10 to 30, 2 grammes; and in those containing above 30 per cent, 1 gramme.

BENZOIC ACID IN GAS LIQUOR.—According to Reinsch, on treating gas liquor with sulphate of lime at a temperature of 50° C., the carbonate of ammonia in the liquor is completely decomposed, with evolution of carbonic acid and formation of a yellowish solution of sulphate of ammonia, smelling strongly of tar. The tarry constituents are not easily separated from the salts of ammonia. If, however, the solution is dried at a moderate heat till no more aqueous vapors are given off, and the residue is then heated in a porcelain capsule covered over with a plate of mica, the mass assumes first a rose color, then a purple red, whilst the mica is coated over with benzoic acid in shining crystalline needles. Over this crust is a tender, woolly sublimate, consisting of sal ammoniac and sulphate of ammonia. If the residue is treated with water and filtered, we obtain a colorless solution of sulphate of ammonia, and on the filter remains an aniline brown coloring body.

THE electrical conducting power of a metal is diminished by heating it. A poor conductor is more easily heated by an electrical discharge than a good conductor. Thus a stroke of lightning that would fuse an iron rod would not injure a copper rod of the same dimensions. The conducting power of copper is 120, while that of iron is only 24.

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Infection and Disinfection.

The water of low, moist and marshy places is productive of various maladies, particularly of dysentery and chronic diarrhœa, and many pernicious effects are produced by the exhalations of various gases rising in sewers, sinks, etc. When low and moist grounds and deep and rich soils, covered either by water or large trees, are cleared or exposed to the action of a warm sun in a hot climate, the emanations prove more noxious than in their unreclaimed state, and will remain so until a complete cultivation has taken place. The various exhalations and secretions formed in the course of disease are either entirely of insensible emanations from the bodies of persons affected by the earth emanations and specific fevers, which we may term *infectious*, or altogether of a consistent and palpable fluid, formed on the morbid surface of the diseased body (the itch may serve as example), and which we call *contagious*.

Many of the maladies propagate themselves both by impalpable or invisible emanations from the body floating in the surrounding atmosphere, and by the contact of a consistent fluid or virus formed in the diseased part as we see it in the small pox and plague, both of which are infectious and contagious. Typhus and scarlet fever are conveyed from one person to another by bringing substances capable of absorbing and retaining for a time the emanations given out from the diseased body; and among the materials known as the *media* of transmitting infectious diseases are such as woolen and hairy substances, furs, feathers, bedding and clothing. They all appear to imbibe easily the morbid effluvium, and to retain it longest. Cotton, flax, linen and other substances of a soft or porous nature exercise a similar property, but in a feebler manner. They consist in the destruction and exclusion of infectious agents, or preventing communication with infectious persons or things: by the quarantine or separation of the infected from the healthy; by the exclusion of infected articles, or destruction of all infection existing in them, and particularly by applying remedies which dilute or destroy the infection floating in the air or in any other medium, or by chemical agents, which are the hygienic safeguards against all infectious, malarious and contagious diseases, and which are called the disinfectants.

All substances which act more or less energetically on fetid and offensive effluvia, whereby their unpleasant odor is destroyed, are called by the general term disinfectants, or deodorizers, for they render *miasmata* inert, while another class, allied to them, are called antiseptics, because they check or prevent putrefaction. Warmth, air and water promote putrefaction, while cold, exclusion of atmospheric air, and desiccation are the best antidotes; also gases which do not yield oxygen to organic matters, coatings of oil, butter, tallow, wax, resin and sirup all act antiseptically, for they exclude the air.

Among the disinfectants employed for neutralizing contagious and malarious diseases, or destroying the germs of infection, either from ship fever, cholera, bilious and yellow fevers, small pox, typhoid and scarlet fevers, rinderpest, etc., are the following:

Chlorine acts energetically through its affinity for hydrogen; also on sulphuretted hydrogen, ammonia, phosphuretted hydrogen, and other fetid and offensive vapors arising from decomposition of animal matter, marsh gases, cesspools, sinks, and in the atmosphere surrounding dead bodies; but chloride of sodium is very frequently employed for the above purposes.

Nitrous acid is unquestionably one of the most powerful disinfectants on board ships where ship fever or cholera has broken out.

Salt baths are very useful and economical disinfectants, such as the nitrate of lead—half a pound to ten gallons of water is effectual; chloride of zinc for this purpose is in great use in England.

The sesquichloride of iron, with the addition of a small portion of carbolic acid, is now used in the city of New York by the butchers, night scavengers, and in small pox districts by order of the Board of Health; it is called the Metropolitan disinfectant. This preparation has become quite celebrated, and may easily be obtained by dissolving the native sesquioxide, a hematitic iron, in hydrochloric acid, and adding about 57 per cent carbolic acid.

Copperas is much used for disinfecting sinks; it is very cheap and useful.

The Girondin disinfectant is a French preparation, composed of sulphates of copper and zinc.

Condy's liquid is a solution of manganate and permanganate of potash. It is a very useful disinfectant for the reason that it readily parts with its oxygen in presence of organic matter.

The bromo-chloralum is a disinfectant of a late date, which is mostly employed for embalming dead bodies, principally in France.

The Egyptian powder is a composition of crude carbolic acid and pipe clay.

Infected clothing may be restored and made innocuous by exposing it to a temperature not below 200° F.; the infectious germs of certain diseases such as scarlet, yellow, typhus and ship fevers are entirely destroyed.

Ventilation is one of the most indispensible measures for producing disinfection.

Cotton, arriving from southern climates where contagious diseases prevail, and which might communicate such diseases, is said to be preserved by permanganate of potash, as it destroys effectually miasma, and also organic spores which cause fermentation and putrescence.

Dry earth cannot be surpassed as a disinfectant, and possesses many advantages over all others. It is the cheapest material, without odor, does not contain poisonous salts as do all other disinfectants, is an excellent fertilizer, requires but a small quantity to effect the object, and the apparatus may be easily applied in sick rooms, both in public, private, and school houses. Common street earth, charcoal, peat, bone-black and clay are all good materials for the absorption of bad odors and the promotion of decay of organic matter. Dry earth acts both physically and chemically, for it absorbs the water which would otherwise assist in fermenting the organic matter. If dry earth is intended to be used as manure, plaster of Paris, burnt lime and similar vehicles may be mixed with the street earth.

Blacksmithing in Germany.

In the interior towns and villages of Germany, it has been the custom for many years, says the *Coach Maker's Journal*, for the farmer to purchase the iron for his tires and horse shoes, and in some instances, when having a new wagon built, to purchase all the iron entering into the same, the lengths of every piece being furnished him by the smith. One part of the contract is that the smith shall return to the farmer all ends and cuttings from the iron, and it frequently occurs that the farmer remains at the shop until the iron is all cut up, in order that the smith shall not indulge in too much cabbage. Each smith shop has what is termed "the hell," and in cutting off a set of tires, if the farmer be not present, the largest half of the end cut off finds its way to "the hell;" the duty of putting it there devolves upon the youngest apprentice. From this always plentiful store, the smith furnishes his material for the manufacture of bolts, horse shoes, etc., for transient customers.

The horse shoeing part is also a feature; the farmer will bring with him the end of some piece of iron or tire, with which to make the shoes, or perhaps a dozen or more old horse shoes to be converted into new ones. The farmer must blow the bellows until the work is forged or the shoes all made, and must then hold up the horse's foot while the shoes are being driven on or fitted or taken off, and invariably carries the old shoes home with him, unless he prefers to give the old shoes in payment for the apprentice's services in holding up the feet.

The Cattle Plague.

Dr. Bouley, an eminent physiologist and veterinarian, who has given special attention to the cattle plague, has lately made a very important report, to the Academy of Sciences of Paris, of the proceedings of the International Sanitary Convention, held March 16 of the present year at Vienna. This has for its special object the determination of the best methods of preventing the cattle plague, and the taking into consideration the question of establishing proper sanitary regulations in regard to the cattle traffic between the countries represented in the convention. Delegates from eleven states were present at the convention, namely, Germany, Austro-Hungary, Belgium, France, Great Britain, Italy, the Roumanian Principalities, Russia, Servia, Switzerland, and Turkey.

The delegates included in their number some of the best veterinarians of their respective countries, as also various officers specially charged with the enforcement of sanitary regulations. There was but little contrariety of opinion as to the exotic nature of the disease (at least in regard to Western and Central Europe) and as to its mode of propagagation. It was well established in the convention that, outside of Russia, it never develops spontaneously upon any race of cattle, not even that of the steppes; and consequently that, whenever it shows itself outside of its native home, it may be considered as imported.

It is also well established that, even after it has continued for a longer or shorter time in any given country, it is only transmitted by contagion, and that it always becomes extinct when the conditions favorable to its propagation cease to exist.

It was considered expedient by the convention to leave Russia entirely out of the sanitary agreement, and not to permit the exportation of its cattle except upon certain well established guarantees.

As to the general question of absolutely preventing the importation of cattle from Russia, it was found very easy so far as Germany was concerned; but very difficult for Austria and Hungary, owing to the great extent of the coterminous boundaries of the two countries, and the dependence of Austria upon Russia for this source of food. It was, therefore, recommended that a careful supervision should be exercised, and that cattle, after crossing the frontier, should be subjected to quarantine of ten days before resuming their journey.

The question being thus settled in regard to the importation of animals from Russia into Austria, the next point that came up for consideration was the nature of the conditions that the several governments should impose upon themselves toward doing their share to prevent the introduction or spread of the disease; and the measures concluded on as most essential were: first, the immediate slaughtering of all animals that had come in contact with the plague, as also of those which might be considered as under suspicion of having the disease, in consequence of the influences to which they had been exposed, this being accompanied by a proper compensation to the owners; secondly, the burial of the dead bodies of all animals affected with the plague, without attempting to utilize them in any way whatever; thirdly, the utilization of the flesh of sound animals killed under suspicion, but proved after death to have been healthy, this to be permitted only under special conditions rigorously determined; fourthly, the destruction of the germs of the contagion wherever they can be found, in the slaughter houses, on harness, in pastures, in railway trains, etc., as also the disinfection of all objects with which they have been brought in contact; fifthly, isolation, as complete as possible, of the places where the plague has been found to exist, so that no animal believed to be capable of carrying the contagion or of receiving it shall be allowed to enter the infected districts, this isolation to be put in practice on farms and all other localities, and to be of greater or less extent, according to the extension of the disease.

The convention found that, among the various countries that had had occasion to take measures for the proper disinfection of cattle cars and other vehicles of transportation, Germany had the most satisfactory arrangements. Here, after a train has been emptied of its contents, the cars are immediately deluged with warm water of at least 160° F. The shock and strength of the current, falling from a considerable elevation, detaches all organic material adhering to the wood work, and, by the elevation of temperature, annihilates all virulent activity.

The principal point established by the convention, according to Bouley, was the necessity of an obligation to slaughter all animals as soon as the disease made itself manifest, or as soon as there seemed a probability that an animal would be attacked. In this way the plague will be arrested by sacrifice of the smallest number of animals.

Chemical Fertilizers.

There are certain fertilizers, says the *New York World*, which are strictly chemical, being the result of chemical processes; there are others not usually so termed which should be thus designated because they act chemically in the soil, that is, they are inert and thus valueless unless some substance for which they have an affinity exists or is placed in the soil together with them. To the first class belong the various salts of ammonia, to the second, plaster and common lime, while in both classes may be placed sulphates of soda and potash. However and whenever we use any of the ammonia salts, they are of value in themselves, but plaster and lime and salt are little if any value in themselves; yet if the soil has in it any decaying vegetable or animal matter, and if it be desired to set free the silica, then these substances work actively and are of great value. We cannot see that sulphate of soda is of much greater actual value, except for cotton, than plaster, while it is much more costly. Sulphate and muriate of potash are of far greater value as, when their acid constituents are given up to fix any free ammonia, their potash is freed and is an element available and useful to almost every crop.

The multiplication of chemical works in our country has caused the production of many of these elements as waste products, and hence chemical fertilizers, once very costly, have now come down to a comparatively low rate. We know one concern which does a large business in these manures, which was directly forced into it to get rid of the vast accumulation of waste material. The supply created a use, and good results from use made a constant demand. And as there is an increasing demand, every day adds some new source of supply. There is now throughout this country millions of dollars worth of material going into apparent waste which might be caught up and made to do service for the present generation. The sewage of hundreds of cities, the ammoniacal waters from as many gas works, the excreta from thousands of privies in towns, villages and country homes: these are but part; the waters of the East and North Rivers, of the Merrimack and the Delaware, and numerous other streams all float off material, called refuse, which contains the great elements of fertilizing.

Chemical fertilizers are usually rapid in their action; the farmer who invests in them gets a prompt return for his money. Manuring for generations yet to come is good sound theory, but is an idea not appreciated in this fast age; it has been almost universally abandoned in England, where the chemical or concentrated manures are largely used and highly recommended by men of high reputation, both farmers and scientists. We are not yet willing to advise farmers to abandon the barn yard and compost heap which has done such good service, but there is an evident want of some more active direct fertilizer, or some elements to be combined with those bulky matters to add to their value or develop more rapidly the useful constituents they contain.

We have not alluded to the prepared superphosphates and poudrettes, which might be classed as chemical fertilizers as they are passed through a chemical process in their manufacture; they are more the result of object than the residue of a chemical process; nor have we spoken of the various fertilizers, derived from the earth, which are identical with certain chemicals; they are more fit to be classed as mineral fertilizers. We believe that the settlement of our great Western plains and mountains will develop there such masses of these substances as will amply make up to the farmers of the Western States their distance from the sources of fertilizers of that character from abroad, or the lack of vast chemical works whose waste materials afford the base of most of the strictly chemical fertillizers.

A VERITABLE earthquake was felt on the 11th of July in the vicinity of New York city, in Westchester county, and on Long Island. The shock is reported at the beginning to have been similar to that of a piece of artillery or heavily laden cart driven rapidly over frozen ground. It seemed to come from the south and roll away off toward the north. It was sufficiently loud to awaken nearly all the sleepers, to cast down piles of coal in the cellars, to shake the crockery in the rooms, and to give a very perceptible vibration to the houses.

THE financial report of the late Musical Jubilee at Boston, Mass., exhibits a deficit of one hundred and fifty thousand dollars.

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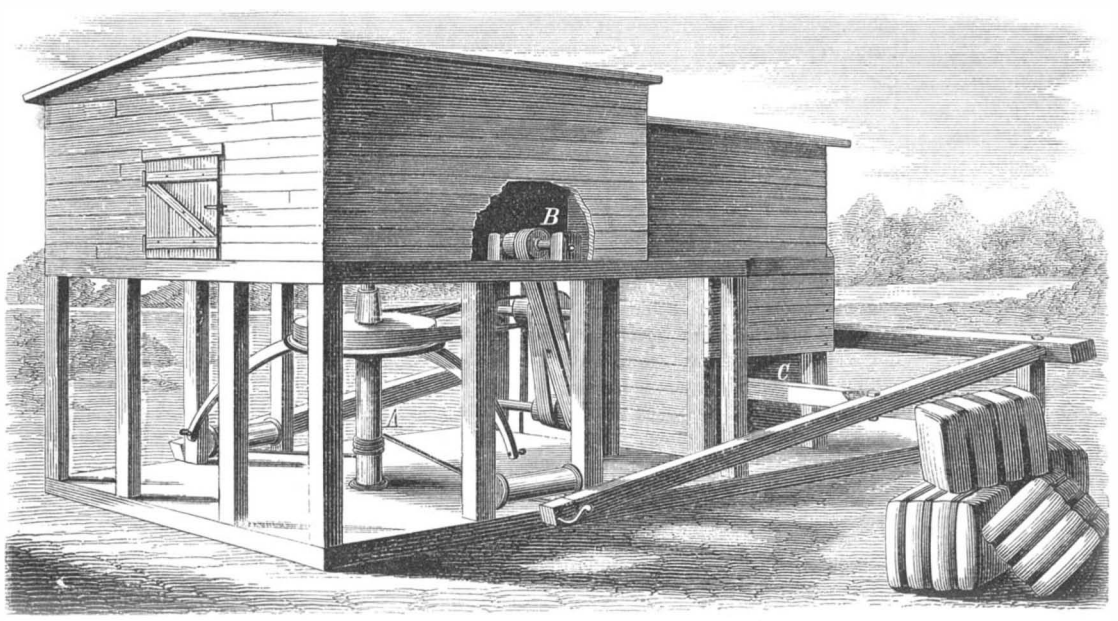
COMBINED GIN HOUSE, HORSE POWER, AND COTTON PRESS.

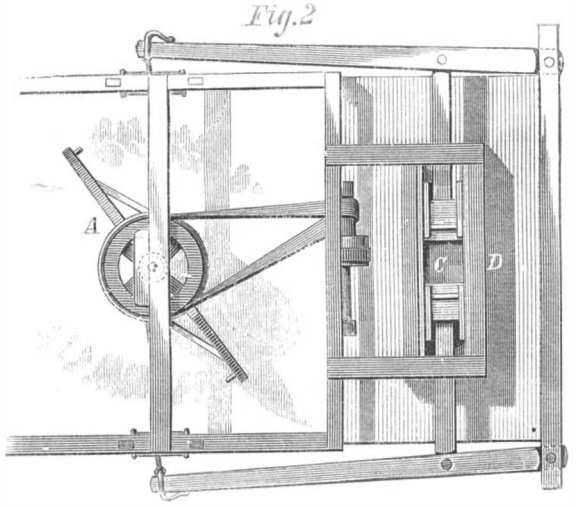
In the invention we now illustrate, the cotton raiser is supplied with an apparatus, for preparing his cotton for market, of an economic and at the same time effective character. It consists in the combination of a horse power with a gin and press, in such a manner that the gin discharges its cotton directly into the press, and the gin and the press are both worked by the one horse power.

Fig. 1 shows the general arrangement, which the following description will explain: A frame, such as represented, is erected for the working parts of the machine, and supports on its top the gin house. At A is the horse power and driving shaft and pulley. The latter is connected by belting, as shown, with the countershaft, B, from which the gin is run, so as to insure the requisite amount of speed. The gin is not shown in the engravings, but is so situated as to discharge its cotton into the press, C, which is shown in detail in the top view of the same in Fig. 2. The followers of this press are connected with the two outside levers seen in both figures; the ends of which are, in their turn, connected with the driving shaft. The operation is as follows; The levers are thrown outward so as to draw apart the press followers, and the gin is started and run until the open press, which holds enough for a bale, is filled with cotton. The gin is now stopped and the press completely covered in by means of a lid. The ropes are next wound on to the drawing shaft, and the horse power again started, this time to effect the pressing by pulling in the levers. When the compression of the bale is finished, the team is stopped, the levers secured in their then position, and the ropes loosed from the shaft. A curtain is next drawn between the gin and the press, so that the ginning of a second bale can be commenced while the first is being secured and withdrawn from the press through its face, at D, which admits of being removed for this purpose When this is done, the levers and press followers are



SHAW'S COMBINED GIN HOUSE, HORSE POWER, AND COTTON PRESS

Fig. 2



thrown out to their original position, the cover taken off the press, and the curtain drawn back. The ginned cotton again falls into the press, and after enough has accumulated, a second bale is compressed by a repetition of the foregoing operation.

The superiority of belting over gearing, as a mode of transmitting the power in this apparatus, exists in its non liability to receive damage by a variation in distance between the shafts, which would cause grinding or jumping, and perhaps breakage, in geared wheels. Such variation arises from the constantly changing quantities of seed cotton in the gin house. When full the floor beams, which also support the upper shafts, are deflected by the weight, and as the cotton is ginned out and the weight lessened, they recover their position. The difficulty here pointed out is obviated by the use of belts and pulleys, which have another advantage in the economy of their first cost.

As in this process the cotton goes from the gin into the press direct, no lint room is required, and labor is saved; and as the press takes no more timber to build it than does an ordinary lint room, its cost is reduced considerably—the inventor says to less than one half that of the majority of presses now used. He also claims that a better sample of cotton is produced by his than by the old method, in consequence of its not having to be handled at all on its way from the gin to the press, and that the compression of the bale is accomplished in much less time for the same reason.

The press was patented, through the Scientific American Patent Agency, for the inventor, Mr. James M. Shaw, of Water Valley, Miss. Further information may be obtained by addressing Shaw & Son, as above.

Luminous Electrical Tubes.

One of the most convenient methods of exhibiting the illuminating qualities of electricity is by means of the Geissler tubes, which now form part of the standard apparatus of colleges and other institutions of learning. The Geissler tube—so called after the inventor, Dr. Heinrich Geissler, of Bonn, Germany—consists of a glass pipe sealed at each end, and also provided at each end with a platinum wire which projects into the tube. The atmospheric air is exhausted from the tube, a small quantity of gas or vapor is introduced, and the tube is then sealed. When the two wires are placed in connection with a Rhumkorff coil, a stream of electrical light passes through the tube, taking various forms and colors, which vary with the kind and density of the enclosed gas. Hydrogen yields a white light; carbonic acid, green; nitrogen, yellow, etc. The most magnificent effects can thus be produced. A practical application of this discovery is a surgical lamp which consists of a small glass tube and bulb. The electric light is produced in the bulb, which may be introduced into cavities for medical examination.

Attention has lately been called to another kind of luminous tubes, also produced by Dr. Geissler, in which luminosity is produced without the use of the coil and electric battery.

Such tubes, which contain small quantities of certain gases, as nitrogen, carbonic acid, hydrogen, or ammonia, become luminous after being exposed to friction with any of the well known producers of electricity, as silk, wool, cotton, or even paper; the best, however, are catskin and prepared india rubber, which is now largely employed in the manufacture of combs, etc., and which is also used in the Holz electric machine. This mass is so very sensitive that it is sufficient to make the tube luminous after it has passed a couple of times through catskin, when it is not even touched, but held two or three inches distant. When a rarefied spiral glass tube was inserted in a larger plain tube, spontaneous discharges of light would continue within the former, even after the luminous state of the whole length had ceased for some minutes, and the color of the light is dependent on the quality of the traces of gas left within the spiral tube. Thus with traces of nitrogen it is darkened, very much like the tint of the aurora borealis; with hydrogen it is a light rose, with carbonic acid a bright white, and the spontaneous discharges would be of much greater intensity at a low temperature in winter than in summer. The very curious researches of Dr. Geissler may possibly lead to a clue to the wonderful phenomenon of the aurora borealis.

Another curious discovery of Dr. Geissler was that mercury, when shaken in a rarefied glass tube, would also become luminous, and emit a strong light, so that in a perfectly dark room all objects could be distinctly seen; the color of the mercurial light could be modified by the presence of small traces of gases in the tubes. A minimum of nitrogen shows an intense red, and hydrogen a yellowish light. The capacity of mercury for producing light seems to depend on its purity, so much so that it was not luminous when it contained an admixture of tin, lead, zinc, or bismuth, but gold or silver did not affect it. It would be possible to utilize this peculiar quality of mercury for lighting up chambers filled with explosive gases, such as some parts of mines or powder magazines, instead of using the Davy lamp.

Ferment Fungi.

Dr. Engel, of Strasburgh, has ascertained that alcoholic fermentation is accompanied by the development of two different genera of fungus plants, while that of fruits embraces four kinds. These latter ferments are found almost always on the surface of the fruit, where they remain in a latent condition without development. When, however, the epidermis becomes cracked, or when the stem of the fruit is separated, the ferment (or its spores) comes into contact with the saccharine juices, and the ferment is then reproduced, but always in the form of ferment and never in that of mold. Engel maintains that the alcoholic ferment exists in Nature, although the fact has been denied by others. Thus, as long as a cherry is intact, it has a particular savor; when, however, the stem is detached or the epidermis is cracked, the cherry not only changes its color, but assumes a vinous taste, and exhibits a large number of fermented cellules.

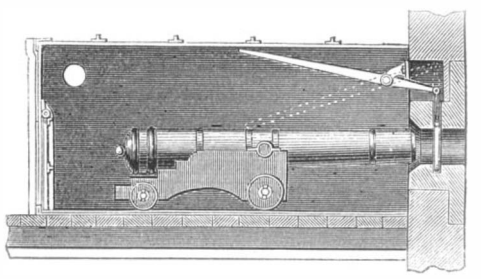
He also remarks that the ferment of bread is of a different species from the yeast of beer, and that he has never been able to germinate the spores of ferments in vegetables which contained but little sugar, or none at all; but that as soon as they come in contact with saccharine liquid, they germinate or reproduce the ferment.

Submarine Warfare.

In 1862, Mr. Thomas Page, of London, proposed to destroy the enemy's ships by means of cannon arranged to be fired below the water line. He proposed to have water tight gun rooms constructed in the hold of the vessel, to be filled with compressed air. At the moment of firing, a valve at the port hole was to be opened, the and gun run out and discharged. Our sketch shows the plan of Page, which, we believe, was never practically tried. Mr. Quick, another ingenious Englishman, has devised a torpedo which is intended to be fired below water line into the unprotected bottom of an enemy's vessel, substantially as previously proposed by Page. Mr. Quick has enjoyed the advantage of a practical trial of his invention under the auspices of the British government. The trial recently took place at Shoeburyness; but the result was not very flattering, and must have been anything but entertaining to the spectators who were thereby endangered.

A 10 inch gun was laid on the beach at about 5 deg. elevation, at a spot which would be covered by about 3 feet depth of water at high tide. The bore was closed at the muzzle by a disk of glass fixed in a wood washer tightly sealed round the edge, while an electric wire led through the vent of the gun to a small igniting charge in the center of the base of the torpedo. The torpedo itself was a cylinder something over five feet long, with a sharp pointed head, and immediately behind it was a space intended to be filled with gun cotton. The after part of the body contained four rockets, which were in communication with the igniting charge, and whose gas escaped on ignition through spiral vents designed to give rotation to the torpedo and keep its axis steady while projecting it through the water. On this occasion, the gun cotton bursting charge was dispensed with, the object being to ascertain what range and direction might be obtained.

When the tide rose and covered the gun, the experiment took place. On firing, the torpedo burst open close to the muzzle of the gun, two rockets rising into the air, one of which descended again almost immediately, while the other flew high over the heads of the spectators. The conditions governing a rocket's motion under water are even more complicated than those in air; the pressure of the gas in every case, of course, increases with the depth of water above the rocket. In fact, to obtain the full development of force without risk of bursting the case, a certain given depth is required. Success could hardly be expected to follow a preliminary trial on a large scale. Even supposing such an engine to be desirable, Mr. Quick's torpedo has hardly reached the stage of development desirable for a public



PAGE'S SUBMARINE GUN.

trial; the same forces which cause the *ricochet* of a shot in water, or, in fact, the bounds of a stone thrown by hand to skim in "ducks and drakes," would always give a submarine rocket, if it moved with a high velocity, a tendency to rise like a Venus out of the sea.

THE NUMBER OF EGGS FROM A HEN.—A German naturalist answers the question, how many eggs a hen can possibly lay, as follows: The ovary of a hen contains about six hundred embryo eggs, of which, in the first year, not more than twenty are matured. The second year produces one hundred and twenty; the third, one hundred and thirty-five; the fourth, one hundred and fourteen; and in the following four years, the number decreases by twenty yearly. In the ninth year only ten eggs can be expected, and thus it appears that, after the first four years, hens cease to be profitable as layers.

PRODUCTS OF THE OSAGE ORANGE.—The wood of the hedge plant known as the Osage orange (*maclura aurantica*), if boiled in water, yields a handsome yellow extract, which is used in Texas as a dye. From it, a large percentage of tannin is also obtained. The seeds of the fruit also yield a valuable oil, abundant, bland, and limpid, resembling olive oil, and burning with a steady flame in an ordinary lard oil lamp.

MR. G. G. PRINDLE, of Chittenden county, Vermont, has made an experiment designed to ascertain how far soil is protected from cold by snow. For four successive winter days, there being four inches of snow on a level, he found the average temperature, immediately above the snow, 13° below zero; immediately beneath, 19° above zero; under a drift two feet deep, 27° above zero.

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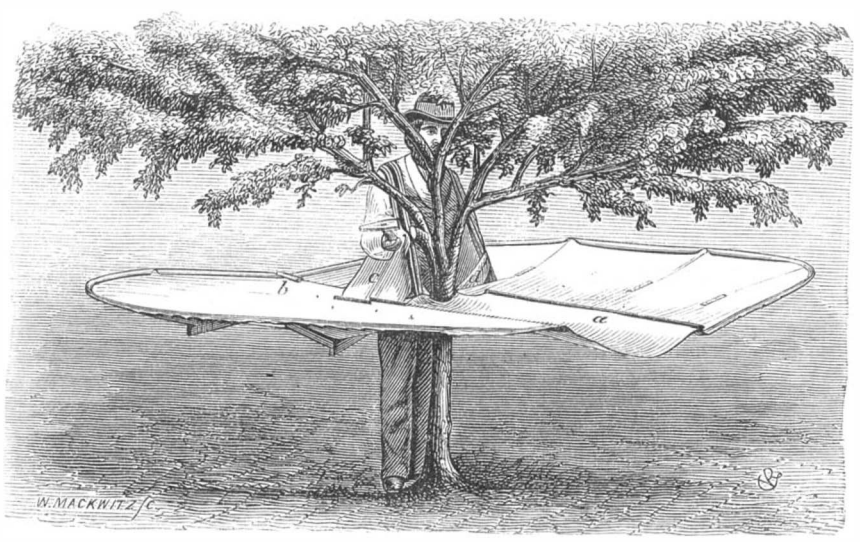
[For the Scientific American.]

THE NATURAL HISTORY OF THE CURCULIO.

BY C. V. RILEY.

The annexed engraving represents an improvement by Dr. E. S. Hull—a well known and successful fruit grower of Alton, Ill.—upon his device, which was illustrated in Vol. XXI. of the SCIENTIFIC AMERICAN, for catching that destructive "little Turk" known as the curculio, or, more properly, the plum curculio. It may be briefly described as an inverted umbrella, and has long been in use among the growers of stone fruit in his part of the country. Several modifications of, and improvements on, the original machine have been made, and notably one which runs on two wheels, by Mr. L. M. Ward, of Benton Harbor, Mich., and one which opens and shuts, fan like, by Dr. M. M. Hooten, of Centralia, Ill.*



All these machines work on the same principle of jarring down and catching the beetles, and they are all intended to economize time and labor in the operation. The jarring is done either by a rubber bumper attached to the machine itself, or by a separate mallet. The former method was employed with the original Hull machine, but was very generally abandoned, as it was found to seriously injure the trees by bruising. Indeed, some years ago I became fully convinced that trees suffered too much from this bumping to make it practicable, unless a shouldered spike, against which the bumping might be done, were driven into the trunk of the tree.

Dr. Hull was wont to claim that he could use his machine without injury to the trees, but the present modification of it is an evidence that experience has taught him differently. In all rolling machines, whether upon one or two wheels, when the bumping was not done by the machine itself, it had to be done by a long pole tipped with rubber, and used by a second person. But where I have used such a pole and separately jarred the larger boughs, the trees have been much injured in the course of a single year's work, and, in some instances, killed outright.

The advantages of the present modification over the others may be thus briefly stated: It costs less, and enables the operator to get close to the tree, to which he can give a sudden jar with a hatchet or hammer. This is best done by striking a screw or spike previously inserted into the trunk and purposely made with a shoulder so as to prevent driving; or by striking the end of a limb previously sawn squarely off. Such a hard sudden jar with an iron instrument is far more effectual in bringing down the beetles than the more subdued bumping of a rubber mallet, as it is the sharpness and suddenness rather than the force of the blow which disturbs and alarms the little shy and cunning customers we have to deal with.

The working of the machine is very well indicated in the illustration. There is a bag, *d*, in the center, into which the operator can brush all fallen fruit, and a bottle of cheap alcohol may be kept in the vest pocket into which the beetles should be thrown.

Let me now give you a condensed history of the pest which may be, in great part, conquered by the proper use of such machines, as such an account will not only show the philosophy of the machine, but will render it impossible for paragraphs like the following, which I clip from a late issue of the SCIENTIFIC AMERICAN, to find their way into your columns without comment:

CURCULIO ON PLUMS.

A correspondent says that he wraps plum trees, below the lower limbs, with cotton, which he keeps wet with camphor and spirits of ammonia. He wets the cotton twice a week, and the result has been a good crop of plums and no curculio. A correspondent in another journal says:

"I have seen various methods for keeping these insects off plum trees, but none so simple or yet so effectual as the following: Soak corn cobs in sweetened water until thoroughly saturated, then suspend them to the limbs of the trees a little while after blossoming, being sure to burn the cobs after the fruit ripens, as they will be found full of the young insects. A good plan is to change the cobs every few weeks. My theory is this—that the insects deposit their eggs in the cobs in preference to doing so in the young plums. The first season I tried it upon one or two only, and in the summer was rewarded by a good crop of as fine plums as ever ripened, while those on the other trees fell off when about half grown. I have since tried it more thoroughly and have never known it to fail."

Now, as to the first remedy, your correspondent might just as well put the cotton round his chimney, under the delusive idea that he could thus keep the flies and mosquitoes out of his house. And as to the second, if persons will hang upon their trees sweetened cobs, as above described, they will, it is true, get eggs and larvæ enough, for some kinds of ants are attracted by the sugar and are very fond of consigning their eggs to the cozy and sweet recesses which such cobs afford. But they will get no eggs or young of the plum curculio, and of that they may rest assured.

You have the satisfaction of being in good company in tacitly giving credence to this absurdity, for the paragraph quoted has been extensively copied, and such being the case it is not to be wondered at that the deluded mortal who first hit upon the idea imagined he had made a grand discovery.

Suppose a naturalist were to make the following announcement:

GREAT DISCOVERY!!!

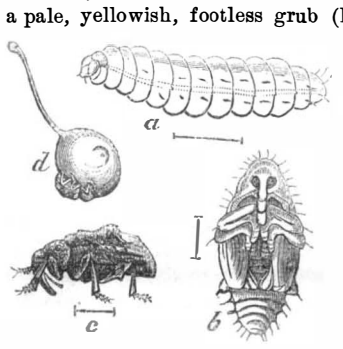
NO MORE CHICKENS KILLED BY HAWKS.

If gunny bags, after being dipped in diluted honey, are hung on the top of the chicken house, the hawks in the neighborhood will mistake them for nests and fill them with eggs. These bags, when full, are easily collected, the eggs destroyed, and the hawks thus exterminated.

What would be the result of such an announcement? Why every editor in the land, every ten-year-old lad, would scout the whole as a most absurd fabrication, or else consider the author hopelessly insane. And yet this suppositious announcement would not be a whit more ridiculous than is the curculio-corn-cob story in the eyes of an entomologist. Now, I ask, why is it that the one announcement would be so universally considered to indicate stark staring madness on the part of its author, while the other will pass muster with the majority of well educated people? Simply because the natural history of the higher animals is taught, in its rudiments, in our schools and colleges, while that of the more lowly—but none the less interesting and instructive—generally remains a sealed book.

NATURAL HISTORY OF THE PLUM CURCULIO.

The plum curculio (*conotrachelus nenuphar*—Herbst) in the larva state, in which alone it is found working *in* the fruit, is a pale, yellowish, footless grub (Fig. 2, *a*). In the pupa state, in which it is found underground, the color is about the same, but the members are distinctly visible (Fig. 2, *b*). In the beetle or mature form, it is roughened and warty (Fig. 1, *c*), and so colored with gray, brown, white, and black that, when resting on the rough bark of a peach or a plum tree, it almost defies detection, and when lying on a flat surface, with the legs drawn in, looks precisely like a dead bud. It often makes a peculiar creaking stridulation, by rubbing the tip of the abdomen up and down against the wing covers.*



To condense the history of its habits into the briefest possible space, let me give a series of what I know, from personal experience, to be well tested and incontrovertible facts:

1. It is more numerous in timbered than in prairie regions.

2. Under the hard wing covers of the beetle there are folded up two ample membranous wings, with which it can fly and *does* fly; so that cotton bandages, or other like contrivances, placed around trees as a safeguard against its attacks, are utterly useless, and result from ignorance of the insect's habits and nature.

3. It does not often use its wings, however, when alarmed, but has a habit, in common with many others of its class, of dropping and "playing possum" upon the slightest disturbance.

4. It hybernates in the mature or beetle form, principally in the woods, under the bark of trees, but also in any other shelter that presents, in the vicinity of the orchard. The same spring influences, which cause our orchard trees to wake from their winter rest, also rouse the curculio from its dormitory.

5. From this time on, till fruit sets, these beetles are more or less active, and instinctively make their way to our orchards, where they feed on the buds, leaves, and other tender parts of the trees. They are thus, at this early season, more frequently found on the outside rows of an orchard, and especially on those trees nearest the woods, and they may be captured under traps long before their depredations on the fruit commence.

6. It is nocturnal rather than diurnal in its habits, except during the egg-depositing season, when the female, more especially, may often be found at work during the day; both sexes, at that time, rest concealed on the underside of the more horizontal branches, or under whatever other shelter is afforded them in the orchard.

7 The female commences to oviposit as soon as the fruit is as large as a hazelnut. Oviposition is effected in the following manner: With the jaws at the end of her snout, she cuts just through the skin of the fruit, and, running the snout under the skin to the depth of about one sixteenth of an inch, moves it back and forth until the cavity is large enough to receive the egg it is destined to contain. She next changes her position, and drops an egg into the mouth of the cut; then veering round again, she pushes it by means of her snout to the end of the passage; and afterwards cuts a crescent in front of the hole so as to undermine the egg and leave it in a sort of flap, her object being to deaden the flap so as to prevent the growing fruit from crushing the egg. This egg is white, oblong oval, and three hundredths of an inch long. It swells slightly by endosmosis, and may easily be crushed by the thumb nail without injuring the fruit. The stock of determinable eggs in a female, even at the most pregnant season, seldom exceeds thirty, but doubtless ova continue to develop and are repeatedly impregnated, contrary to the more general rule in insect life, which is, that a single coitus suffices for the fertilization of the ova. The period of egg depositing extends over two months or more, and larvæ of of all sizes may be found during the summer.

8. It is single brooded, that is, but one generation is produced annually; and, as a rule, no female lays eggs until she has passed the winter. I have kept specimens alive, and in a continued state of activity, over thirteen months.

9. During the beetle life, both sexes feed as long as the weather allows of activity. While fruit lasts they gouge holes in it, and after stone fruit has gone, pip fruit (apples especially) is badly attacked. At the proper season and under favorable conditions, these punctures and gougings are instrumental in spreading the dreaded peach rot, by forming proper *mdi* for fungi, such as that known by the name of *mucor mucedo*.

10. It prefers smooth skinned to rough skinned fruit, but will mature alike in plums, peaches, nectarines, apricots, cherries; in black knot on plum trees, and in some kinds of apples, pears, and quinces. There is also a larger phytophagic variety which breeds in the rind of walnuts and hickory nuts, but there is no evidence that this variety ever attacks the other fruits mentioned.

11. Varieties of the Chickasaw plum, such as the Miner, the De Soto, and what is known in some parts of Missouri as the Salt Plane plum, are almost entirely exempt from its attacks.

12. It is not subject to sudden decrease or increase, as are so many other noxious insects, for the reason that it is scarcely ever devoured by birds, and has not very many insect enemies.* Yet in a clayey soil, many perish while transforming, if the weather be very hot and dry, so as to bake and heat the earth to an unusual degree; and from this cause, together with the work of its few enemies, its numbers sometimes decrease so as to render it harmless. Such is the case in the vicinity of St. Louis in the present year.

In these twelve paragraphs, we have all the more important facts in the life history of our little Turk. Exceptions, to some of the rules stated, occasionally but very rarely occur.

From this history, we can appreciate the value of the curculio catcher, as there is no other remedy against this pest but to catch and kill. This may be done by the catcher and by the use of traps in the shape of pieces of bark or shingle set around the tree; and by causing all fallen fruit to be picked up regularly either by hand or by hogs.

Spectra of Gases.

M. Cailletet has investigated the influence of pressure on the spectra of gases. He fixed two platinum wires in the end of a thick glass tube, into which the gases were passed. The spark from an induction coil connected with three Bunsen elements passed between the wires. At ordinary pressure, the bright lines of the spectra of the gases appeared on a slightly illuminated ground; and as pressure was increased they grew brighter, but they by and by became merged in a continuous spectrum, whose brightness also increased with the pressure. At a certain pressure (between 40 and 50 atmospheres) the discharge suddenly ceased; and though the battery power was increased and the distance between the platinum wires reduced to ½ millimeter, it was not possible to obtain the spark beyond this point. It is thus seen that a spark, which passes easily in the rarefied gas of Geissler tubes or the electric egg, meets with considerable resistance in compressed gas. The brightness of the spark at the point beyond which the discharge is unobtainable is 200 times greater than at ordinary pressure.

INFLUENCE OF VARIOUSLY COLORED LIGHT ON VEGETATION.—As the result of a series of experiments upon the influence of variously colored light upon vegetation, Dr. Bert has arrived at the following conclusions: 1. That green light is almost as fatal to vegetation as darkness. 2. That red light is very detrimental to plants, though in a less degree than green light. 3. That though yellow light is far less detrimental than the preceding, it is more injurious than blue light. 4. That all the colors taken singly are injurious to plants, and that their union in the proportion to form white light is necessary for healthy growth. This does not agree with the ideas of the Commissioner of Patents, who has granted a patent to Pleasanton for the use of blue glass as an improvement in the cultivation of plants.

*Descriptions of these machines were given in the third Missouri Entomological Report.

* If carefully examined, the elytra will be found to have, on their lower apical edge, a horny, slightly raised plate, about a third as long as the whole elytron, and transversely and obliquely ribbed by numerous parallel ridges. There is also a longer cord or carina near the sutural edge which may help to intensify the noise. The dorsal apex of the abdomen or pygidium forms a yellowish and roughened plate, with the sides horny and emarginate, so that when the abdomen plays up and down, these horny edges grate or scrape at right angles against the rasp.

* Two true parasites (*sigalphus curculionis*, Fitch, and *porizon conotracheli*, Riley,) are known to infest it, while about half a dozen predaceous or cannibal insects have been found attacking it. Ants destroy the larvæ when they can get them, and a species of *thrip* destroys the eggs.

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Correspondence.

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The Young Machinist's Query.

To the Editor of the Scientific American:

On page 20 of your Volume XXVII., "A Young Machinist" says: "It is hard to know that, after serving four years' apprenticeship to my trade, I can only get $3.50 a day for building and repairing an engine, while a man who has served no apprenticeship, and is ignorant of the working of the engine, gets $4.50 for running it. This, I think, is alike an injustice to the machinist and to the public," etc.

The above, boiled down, means that machinists are competent, and should be placed in charge of engines to run them, and no others are eligible to become engineers Many machinists arrogate to themselves (as mechanics) that they alone have a knowledge of the locomotive engine in all its parts, and the ability to repair the same; hence their claim to superiority as engineers. Let us examine some of their claims. The finishing, fitting and putting together the different parts of machinery can only give one a general idea of the principles of construction; others employed about the engine can gain this knowledge with equal facility, and what more can a machinist do, out on the road, in the event of a break down or other emergency, than an engineer who is ignorant of the use of tools? Nothing whatever. Beyond the ordinary work belonging to their trade and the ability to set the valves of an engine, there are but few machinists who know anything about the construction of the valve gear of a locomotive engine or the principle upon which it operates. Many will dissent from this, but I will answer their objections, Yankee-like, by asking a question or two: What causes the lead to vary when a shifting link is used? and why is more steam used in one stroke of an engine, when worked expansively, than the other, in making one revolution?

I would call the attention of the "Young Machinist" to these queries, as he so very bitterly complains of the ignorance and incompetency of others, and I suspect his ignorance of the management of a locomotive is the cause of his being in the shop instead of out on the road. The promulgation of the idea, that a man who is unable (so far as a knowledge of the use of tools is concerned) to build a machine is incompetent to operate or run the same, is absurd; according to this theory, the woman who runs a sewing machine should not only understand the principles of its construction, but should be compelled to build it; so should the telegraph operator, who presumes to run an instrument which he is unable to make, and others *ad infinitum*. "Young Machinist" asks: "Is there no way to prevent railway officials from filling such important places with ignorant men," that is, men who are not machinists? It is well for the public, in whose behalf he appeals so pathetically, that railway officials do not stultify themselves by taking out of the shop a machinist who is ignorant of the management of the locomotive, and putting him in charge of an engine, when they can employ a competent engineer who is not a machinist. Again, railway officials are not in the habit of paying premium rates for ignorance and incompetency, for labor is like any other commodity; it is bought and sold at market rates according to quality, and said officials are generally good judges of the article, though they are not infallible. I would ask, is there no way to prevent incompetent machinists from imposing on railway officials? There are a good many such men in the business.

In conclusion, I would say to "Young Machinist" that my acquaintance with railway officials enables me to know that they want sober, reliable, intelligent and competent men, more especially on their engines; and that there is no law preventing machinists from running engines, except the law against ignorance, and that he would display a better spirit by preparing himself to earn $4.50 a day than by vilifying the men, as poor wretches, who are already able to earn it; for merit has its reward all the world over.

Macon, Miss. OLD FOGY.

Deep Sea Soundings by Electricity.

To the Editor of the Scientific American:

The want of a means by which the depth of water at sea for soundings) may be obtained expeditiously, certainly, and without stopping the vessel's way, howsoever fast she may be going through the water, has been long felt by seamen. Doubtless many disasters, resulting in the loss of vessels, lives, and cargoes, might have been averted had the captain taken the precaution of frequently sounding, but when running "on time," the delay of getting a fair "up and down" cast is often too great, and captains prefer to, and often do, risk getting into shoal water rather than lose the time required to sound. Of all the contrivances now in use, so far as known, to obviate the difficulty, probably Massey's patent is the best, but even that is defective and liable to error.

Fortunately, by the aid of electricity, a ship running along a coast at night or approaching the land in thick weather may, without "luffing to" or "slowing down," keep constantly sounding and obtaining the depth of water with rapidity and precision. Indeed, should the vessel suddenly strike shoal water, the fact is made known the instant the lead touches the bottom, without waiting to haul it in.

It is known by experiment that a lead of a determined shape and weight, with its line attached, will sink in sea water at a certain rate per second. On getting a cast of the lead, then, it is only necessary to ascertain the time the lead takes to reach the bottom in order to know the depth of water.

This is accomplished as follows: The lead line contains a heart composed of two insulated copper wires. The inboard end is connected with a small battery, and, by means of an armature, with a clock. The other end is bent to the lead.

The lead contains two insulated copper wires passing through its length, the upper ends connecting with those of the line. The lower ends, tipped with platinum, are slightly exposed beyond the surface of a false bottom or upper section of the lead. The lower section of the lead acts as a plunger, with a play of about one eighth of an inch.

On striking the bottom the plunger is thrown up, so that a "button" on its upper surface comes in contact with the two platinum points, thus closing the circuit. This is known on deck by the instantaneous stoppage of the second hand of a clock, and the sounding of a gong attached to the clock, the purpose of the gong being to call attention,

The clock is an ordinary time piece with the addition of a second hand pivoting at the center, and long enough to reach the perimeter of the face where are marked the fathoms corresponding to the minutes.

Let it be supposed, for example, that a ship running along the coast at night should, at a certain hour, be, by the chart, in forty fathoms of water. The captain orders a cast of the lead and about forty fathoms of line to be used, the lead weighing say fifty pounds. At the instant of heaving the lead the second hand is set in motion and commences its regular beats; but instead of passing on to seventeen seconds, which is seen, on the face of the clock, to correspond to forty fathoms, the gong suddenly strikes its warning, and the hand is arrested at four seconds, which is seen to correspond to ten fathoms; the captain is thus warned of his dangerous proximity to shoal water and at once hauls off.

A reel fitted in some convenient place aft should be used for reeling in the line and for keeping it in good order. The battery used is simple and inexpensive, and will keep in good working order for eight or nine months, and the clock, gong, and battery may all be contained in a case not larger than an ordinary sized ship's binnacle.

Connected with the same, battery wires may be led throughout a ship for signal purposes, such as for communicating with the man at the wheel, with the engine room, etc., etc.; though if the wires be greatly multiplied, the strength of the battery must be increased in proportion. S. B. L.

Watering Streets and Melting Snow.

To the Editor of the Scientific American:

I notice, in a recent issue, a description of a new plan for watering streets, lately tried in London. Said plan consists in pipes laid close to the kerb stones.

During the very severe snow blockades which occurred in New York four and five winters ago, I proposed to lay iron pipes in the gutters near the kerb stones, said pipes to be supplied with steam, from the boilers of steam fire engines or otherwise, for the purpose of keeping the gutters clear of snow and ice, and also for melting the street snow as it might be thrown to the gutters and thus run to the river by way of the sewers instead of being carted there; and when asked by a critic whether the pipes should remain there permanently I replied "yes," as the same pipes perforated properly would answer for sprinkling the streets in summer by attaching them to the water mains. I should like to see this plan tried on Broadway next winter for removing snow, either with fixed pipes or with a moveable pipe say 100 feet long resting on small wheels or rollers to facilitate its movement and also to keep it an inch or two from the pavement.

Portland, Conn. T. R. PICKERING.

Summer Heat.

To the Editor of the Scientific American:

In your article on summer heats, you state that the mercury rises to 120° in Calcutta; this is correct so far as regards the direct rays of the sun striking the thermometer, but I can assure you from a four years' residence in Bengal that the quicksilver rarely or never rises above 98° when protected from the direct and indirect rays of the sun. There is, however, a difference to be pointed out between the heat of that and this country, namely that, in Calcutta it is a damp heat, making it worse to bear than a free open dry temperature. I may add than in travelling northward to the arid country north of the Ganges where, in their season, the hot winds prevail, the shaded thermometer rises to over 100°; at such times the wind blows as if it had come out of an immense oven, making it painful to face the air, every drop of perspiration being evaporated before reaching the surface of the skin. HOWRAH.

An Optical Experiment.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN of July 13, Mr. R. B. S. expects that an image can be increased infinitely by photography. He is evidently neither microscopist nor photographer. Either of them knows that that idea and hope is as grand as the failure to realize it, simply because the material upon which anything is photographed is magnified in such a provoking degree that, for example, the moon, tele-photographed on glass or paper, would show her mountains imbedded in the fibers of the paper or ravines of the glass, if they could be seen at all, which, however, is impossible.

Let us find a material the surface of which, with a photograph upon it, will not alter or increase under magnifying power, then only Mr. R. B. S.'s hopes will be realized; otherwise our Mr. Rutherford or Mr. Woodward had given us long ago photomicrographs of foraminifera, diatoms, etc., from the chalk cliffs of the moon. CARL MEINERTH.

Newburyport, Mass.

BY simply scratching crossed lines on a cornelian, a white figure may be produced on a red ground.

RECIPES AND EXPERIMENTS.

The following recipes and experiments have not been practically tested by the editor of the SCIENTIFIC AMERICAN, but are published for the benefit of readers who may desire to try them. The editor would be glad to be informed of the results of such trials.

RELIEVING INSECT STINGS.—It is asserted that the intense pain caused by the stings of insects in sensitive portions of the body may be instantly relieved by injecting into the wound a drop of a solution of carbolic acid (1 to 100) by means of a hypodermic syringe. Less prompt relief may be obtained by applying ammonia or tobacco juice.

PRESERVING FISH.—A novel though rather odd method of keeping fish fresh any length of time during hot weather or a very long carriage is to fill the mouth and gills with a paste made of bread crumbs and spirit of wine; then wrap the fish up in fresh nettles and place outside an envelope of straw. This recipe originated in France, and has been put in practice in that country with considerable success.

TO DESTROY FOUL ODORS.—The foulest smells arising from sinks or drains may be destroyed by pouring down one pound of green copperas dissolved in one quart of water.

TO PRESERVE LEMONS.—Lemons may be kept for any length of time by varnishing them over with a solution of shellac in spirit of wine. Query: Could the preservation be effected if the lemons were dipped in a solution of albumen or gum arabic?

TO SOFTEN PUTTY.—A paste of caustic potassa, made by mixing the caustic alkali or even carbonate of potash or soda with equal parts of freshly burnt quicklime which has previously been sprinkled with water, will be found of value to soften putty, around window panes, to be removed when the former has become hard by age.

TO PREVENT LEAD POISON.—Workers in lead should wash their hands frequently in a strong decoction of oak bark, wear short hair, and, during work, cloth caps. The hands should be cleansed and the mouth well rinsed with cold water before eating. The food should contain a large proportion of fat, and milk should be taken in large quantities.

TO RENDER WOOD INCOMBUSTIBLE.—Soak the wood for four or five days in a solution of one pound of alum and one of sulphate of copper in 100 gallons of water.

HOW TO MOUNT CHROMOS.—Procure a stout piece of binder's or other strong pasteboard of exactly the size of the picture to be mounted. To this attach the chromo with any smooth paste. Do not use glue for this purpose, as it is apt to soak through the paper. Care should be taken that the picture is laid perfectly flat, and that all wrinkles are smoothed out. When nearly dry, cover the face of the chromo with a weak size made of the best white glue. Over this, when dry, lay on varnish which must be perfectly clear and pure. Chromos thus prepared will not need to be covered with glass for preservation, but may be treated in the same manner as oil paintings.

The Cause of Consumption.

Dr. Henry MacCormac, of London, in a new book, puts forth the theory that tubercular disease of the lungs is caused solely by breathing air which has already passed through the lungs of either brutes or human beings, or air that is deficient in oxygen. If we assume the quantity of air in the chest at about 230 cubic inches, and that from twenty to thirty cubic inches are changed and removed during each respiration, about ten breathings will suffice to renew or exchange the gaseous contents of the chest cavity. At each inspiration, from 4 to 5 per cent of the oxygen inhaled is, or should be, replaced by about the same quantity of carbonic acid, an amount which in a few hours would be represented by an appreciable weight of solid carbon. If any portion of the inhaled air be prebreathed air, says Dr. Mac Cormac, the dead metamorphic carbon will be retained *pro rata* unoxidised within the organism. This effete unoxidised carbon—this "detritus of degradation" being retained—speedily becomes "tubercle."

He says that without adequate ventilation we cannot possibly get rid of the ten or twelve hundred cubic inches of carbonic acid which the lungs eliminate hourly. He has also been at some pains to obtain the average death rate from consumption in various parts of the world. We learn from him that in the Austrian capital phthisis prevails to such an extent as to have been named *morbus Viennensis;* but he traces the cause readily enough to close stoves in stuffy chambers, to doubly glazed and padded windows, which are never opened, ventilation being entirely unthought of. A similar state of things he finds to exist nearly everywhere, the deaths being from 28 per cent in some parts of America to 10 per cent in Paris, while in St. Petersburg, out of 5,000 deaths, 1,900 are occasioned by phthisis! "Double doors and windows, every interstice being carefully closed with wadded cloth or *voilok*, exclude the current, and, along with the close stove or *petch*, render stagnant utterly the stinted, breath-fouled atmosphere, effectively hindering its replacement from without, and, in fine, entailing the direful scourge of tubercle, from which no class or condition of the community finds escape."

The Uses of Mineral Waters.

It would be a most desirable study in this country for a physician of experience in such matters to make a tour to our most renowned mineral waters, and to ascertain, more accurately than we can now learn, their real merits. Most of the published descriptions now extant are by proprietors, hotel keepers, or those in their interest, who are only concerned to brag as loudly as possible about the virtues of particular sources.

Certain it is that the prolonged use of any mineral water,

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in health or disease, is of doubtful efficacy, and is generally directly prejudicial.

Magnesia in large quantities is objectionable, as are also lime salts. They are liable to cause dyspepsia. It is said that horses acquire a rough coat if supplied with water containing a large quantity of sulphate of lime. Goitre and cretinism are attributed to these impurities in water; at least, the facts observed make this reference extremely probable. The goitre appeared in the Durham jail, afflicting a large proportion of the convicts. The spring water with which they were supplied was analyzed, and found to contain 77 grains of lime and magnesia salts per gallon. On substituting for this a water containing only 18 grains of these salts, it was found that the old cases rapidly improved, while no new cases made their appearance. It is a curious fact that in Ireland, on the Waterford side of the Suir, where sandstones and slates prevail, goitre and cretinism are almost unknown, while on the Kilkenny side, where limestones abound, goitre is not uncommon.

Still, perfectly pure water is not the best for a common beverage. Every one knows that distilled water is flat and insipid. It is probably not even the healthiest. Dr. Letheby, one of the highest authorities on the sanitary relations of water, considers water of moderate hardness preferable to very soft water for domestic purposes. About six grains of carbonate of lime per gallon is desirable. He finds that the death rate is less in cities supplied with moderately hard water than in those supplied with soft water.

It is a familiar fact that it is a great advantage in making tea or coffee to use water of about five degrees of hardness, that is, containing about five grains of carbonate of lime or its equivalent in the gallon. The fine flavor of tea made with such water is due to the fact that the carbonate of lime prevents the water from dissolving the astringent matter contained in the tea, without interfering with the extraction of the theine and the other desirable constituents of the leaf.—*Medical and Surgical Reporter.*

The New Pile Driver.

The *American Builder* (Chicago,) says that F. C. Prindle, civil engineer, has made a report of the marvellous success of the new method of shooting piles into the ground with cannon, now in use in the Government construction of the new landing wharf on League Island, in the Delaware. More than 800 heavy yellow pine piles, averaging ten inches middle diameter, have now been driven through mud and clay to a very hard bottom, twenty-one feet below mean low water. The machine was secured to a large scow, in the usual manner, assisted by a small engine to hoist the piles into position.

The gun, weighing 1800 lbs., has a 6¼ inch bore, 24 inches deep, pointing upwards, and is recessed at the lower end to, receive the head of the pile, upon which it rests.

The ram, weighing 1300 lbs., moves in the same guides as the gun, and is provided with a piston, projecting from its lower end and neatly fitting into the bore of the gun, its upper end having a bore of greater diameter to receive a fixed piston secured to the top of the frame and thus form an air cushion to prevent its escape from the guides when the hight of its rebound is limited, as during the first blow with very long piles. The ram is caught and held at its highest ascent, and also released for the succeeding blow, by the operation of a friction brake at one side pressing it against the opposing guide—all at the will of the operator on deck.

The operation of driving is as follows: The engine hoists the ram, gun, and pile into position simultaneously, with one movement; the brake is then applied, holding the ram in place, uppermost, and the gun and pile are then lowered together until the pile rests in the mud; the gun is then lowered on the top of the pile, the recess securely holding the pile head in place directly underneath.

A cartridge is then dropped into the gun, the operator releases the brake, and the ram falls with its piston entering the bore of the gun (which is made slightly funnel shaped at the muzzle), and by compressing the air, exerts a gradually increasing downward pressure upon gun and pile, till the inertia of both is more or less entirely overcome, the cartridge is crushed by the piston, and ignited by the heat evolved by the sudden and severe compression of the confined air. An explosion immediately ensues, the result of which is to violently force the pile downward, and this is measured by the reactionary effort upon the ram—the hight to which it is thus thrown, practically, I suppose, from a state of rest. The force due to the fall of the ram, and the explosive force exerted to throw it again in position, are thus at once combined and applied to the pile.

The principal difference of effect, between this method and the ordinary hammer, appears to be just here: in the one case, the pile is already in motion when a tremendous force is suddenly brought to bear upon it in the same direction, and in the other case it receives a violent blow when at rest, and a considerable portion of the force is expended uselessly in the destruction of the pile head itself, before its inertia is overcome and motion produced. Hence the necessity of strongly banding the pile heads in the latter case, and the utter absence of any necessity for their protection in the former.

The ram, on its rebound, is caught and held by the brake, and the operation repeated at pleasure. On January 13th, twelve piles were driven in a single hour. The piles were all driven without the slightest injury, and none of them showed any marks of violence. An engraving of this novel device will be found on page 97, Vol. XXI of the SCIENTIFIC AMERICAN.

Chang and Eng.

The Raleigh *North Carolinian* says: "The Siamese twins Eng and Chang, who are now living in the western portion of this state, and one of whom is lying dangerously ill at the present time, were born in a small village on the coast of the Siam in the year 1811. We are in possession of some particulars concerning them which may be of interest to our readers. Their parents got their living by fishing. And until 1829, when Eng and Chang were brought to the United States, they made their living by selling shell fish. Their mother bore seventeen children. At one time she gave birth to three, and never less than two. But none of these children were deformed. While you may whisper in the ear of one without the other hearing, while volatile salts applied to the nostrils of one has no effect on the other, and while pinching the arm of one excites no sensation in the other; still, if you but stick a pin in the exact vertical center of their connecting link, both will flinch from the hurt. These twins are seldom observed to converse with each other. They play a good game of draughts, make pretty much the same moves, and at the same time, and frequently play against each other."

Remarkable Electrical Instruments.

At a recent meeting of the Society of Telegraph Engineers in London, first and foremost among the objects of interest was Lord Lindsay's giant electro magnet, by far the largest in the world. It stood in one corner of the largest room, and consists of several straight massive horizontal bars of soft iron, running upon wheels, and so arranged as to form a rectangle; the opening between the poles is narrow, only a few inches. Lord Lindsay had to jump over the bars to get into the open square space in the center, and observers stood outside watching his experiments. The magnet consists of more than 26 ft. of iron, each bar having a sectional area of about 36 inches; we were told, says the *Engineer*, that it weighs about six tuns, and has fourteen geographical miles of conducting wire wound around it, the coils being then protected by outer casings of wood. It was charged by means of a powerful battery, but as the Grove's battery used for the purpose is not yet completed, only one fifth the power of the magnet was, according to Mr. Varley's estimate, developed at the *soirée*. Under these conditions, a plate of copper fell between the poles, at the rate, as nearly as we could judge, of ⅓ inch per second, this slow fall through the air being due to the mysterious action of the magnetic rays upon the electrical currents which those rays induced in the copper plate. One experiment which particularly attracted the attention of the observers was that of inserting a lighted taper between its poles, where it burnt freely so long as the magnet was charged, but directly the current was broken and the magnetism disappeared, the taper was extinguished.

The induced current produced in the wire by the cessation of the magnetism when the battery current is removed is so powerful that the shock would probably be fatal to any person who by an unfortunate accident happened to complete the circuit at the time. To guard against this, a very elaborate current reverser has been constructed by Messrs. O. and F. H. Varley, which breaks the circuit gradually by introducing resistances varying from nothing up to infinity. The magnet itself was designed by Mr C. F. Varley. The conducting wire weighs about 600 lb. to the geographical mile, and is nearly ¼ inch in thickness. We are told that the battery ultimately to be used with this magnet will consist of 150 of Grove's nitric acid cells, each platinum plate of which will expose a square yard of surface, both sides of the plate included. A battery of this colossal size has never before been constructed, nor indeed at all approached in in dimensions.

All the parts of the magnet, as already stated, run upon wheels, and the front bars are governed by a screw motion, so as to accurately adjust the distance between the poles.

In the course of the evening Mr. Ladd froze some mercury, and the solidified metal was allowed to fall between the poles to see what diamagnetic effects would result. There were none at all so far as we could see. Most of the observers had taken the precaution of giving their watches into the charge of attendants, lest their good time-keeping qualities should be destroyed by the action of the magnet upon the steel springs.

Another chief object of interest was Sir William Thomson's siphon galvanometer. The apparatus is now in practical use for the reception of messages through the Indian cables, and it is a good instrument for registering indications produced by feeble electrical currents.

Mr. C. F. Varley exhibited a battery, very useful for testing purposes where high potency combined with extreme uniformity from day to day is of vital importance. He exhibited 1,000 of these cells, as well as a number of condensers invented by him to enable long submarine cables to be worked rapidly and continuously. The sheets of tinfoil in these condensers are so completely insulated that once when they were charged with 1,000 cells and left for three months, at the end of that time, enough of the charge remained to give a brilliant spark. At the *soirée* he discharged the condensers through a sewing needle; the steel was blown into vapor and molten globules, with a loud report and a bright flash of light; some of the globules were blown to the further end of the room. Fine platinum wire was in like manner blown into vapor, but not into globules.

Mr. Apps, the optician, exhibited a very beautiful Gassiott cascade made by him for Lord Lindsay; the electrical stream passed over the edges of a vase made of uranium glass placed under the receiver of an air pump. He also exhibited a vacuum tube twisted into very large letters, constructed of uranium glass, and exhausted to a high degree so that only ⅛ inch spark was required to illuminate it; this was proved by allowing the spark to pass in air between the terminals of the coil. Mr. Apps also had on view several of his patent induction coils; one of them gave a spark 6 inches in length, though of the size only, he states, of an ordinary coil giving a spark of 1½ inch. One of the most useful instruments he had on view was De Wilde's electrical probe and forceps, as used in H. M's. military hospitals and by the Prussians during the late war. The principle of the probe is that it carries within it two wires connected with the opposite poles of a weak battery; a current cannot pass till the ends of the wires at the extremity of the probe touch the bullet; the circuit is then completed, and by an electromagnetic effect the existence and position of the bullet are made known to the operator. The apparatus is intended to make bullet extraction as easy an operation as possible, attended by the minimum of pain to the sufferer. Among the other things which Mr. Apps exhibited were tubes containing sulphate of strontium and sulphate of barium, which remained phosphorescent many minutes after the cessation of the spark; and an improved Wheatstone's bridge arrangement, giving a scale of differences from 1,000 to 1; there was also included a small ivory disk arrangement for reading off approximately very small resistances, to one millionth of an ohm.

Lord Lindsay exhibited among other things a large induction coil, which gave sparks 20 inches long in air; this coil was made for him by Messrs. O. and F. H. Varley. The last mentioned manufacturers exhibited a vacuum tube 9ft. long, which was brilliantly illuminated. They also exhibited a pencil writing Morse instrument, for which they claimed more cleanliness and a higher rate of speed than with an ink writer; and among their instruments was one of the vacuum lightning protectors for submarine cables, used to prevent lightning, which may strike the land wire, getting into any cable connected therewith.

Suint.

In nothing is the spirit of the age more clearly shown than in the efforts made to utilize waste substances. This is being done with such effect that what was formerly got rid of with great difficulty and at considerable expense may become one of the most important objects of manufacture. We need only point to such matters as sewage, the slag of furnaces, the fine coal of commerce, the waste of pyrites used in the manufacture of sulphuric acid, etc., as illustrations. Quite a recent instance of this improved economy is found in the treatment of the wool of sheep. It has been ascertained that sheep derive from the soil upon which they pasture a considerable amount of potash, which, after it has circulated in the blood, is excreted from the skin with the sweat, and remains, generally in connection with this, attached to the wool. Chevreuil discovered, some time ago, that this peculiar mixture, known by the French as suint, constitutes not less than one third the weight of the raw merino fleece, from which it is easily removed by immersion in cold water. In ordinary wools the suint is less, the amount being about 15 per cent of the raw fleece. Formerly it was considered as a kind of soap, mainly for the reason that the wool, besides this, sometimes contained about 8 per cent, or a not inconsiderable quantity of fat. This fat, however, is usually combined with earthy matters, mostly with lime, and consequently forms a soap which is very insoluble. The soluble suint is a neutral salt arising from the combination of potash with a peculiar animal acid, of which little more is known than that it contains saltpeter. Special effort has lately been directed to suint, in order to obtain as much as possible of the potash eliminated from the animal, and a special industry has been established in various portions of the great French wool district, such as Rheims, El Bœuf, etc.

A company purchases from the wool raiser the solution of the suint obtained by rinsing the wool in cold water, the price paid for it being higher in proportion as it is more concentrated. As a general thing it is maintained that a fleece weighing nine pounds contains about twenty ounces of suint, which should contain about one third part, or six to seven ounces, of potash, although not more than five and one half ounces are perhaps directly available.

In the wool manufactories of the towns just referred to, there are nearly 60 000,000 pounds of wool washed annually, the yield of about 6,750,000 sheep. This quantity should contain over 3,000,000 pounds of pure potash. Thus, the water in which the wool is washed, and which has been heretofore thrown away, is made to yield a product, adding appreciably to the value of the wool itself, and more than covering the cost of its treatment. It is, of course, not an easy matter to utilize this solution of suint on a small scale; but wherever the work is carried on by the wholesale, as it is in connection with all great manufacturing establishments, it will undoubtedly become a regular part of the process of manufacture.

Samuel C. Bishop.

Mr. Samuel C Bishop, proprietor of the Bishop Gutta Percha Works, New York city, died here July 4th from prostration by the heat. Mr. Bishop was for many years connected with the production of gutta percha goods, and in fact was one of the earliest introducers of the gutta percha industry in this country, finally becoming the sole manufacturer. One of the most important uses of gutta percha is for electrical insulation. The gutta percha covered wires and cables made by Mr. Bishop are used everywhere for submarine telegraph purposes, in mines for blasting, etc.

SIGNOR G. A. Pasquale attributes the injury to vegetation, by the recent eruption of Vesuvius, to the injurious effects of the chloride of sodium which falls in considerable quantities with the ashes.

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MASTERSUN'S CANADIAN TURBINE.

Our engraving illustrates a very ingenious invention, lately patented through the Scientific American Patent Agency by Mr. W. G. C. Mastersun, of Hinchinbrook, Huntington Co., Province of Quebec. By various skillful devices, which we shall describe, he supports a water wheel and chute independently of each other, but in such a manner as to allow of their both being raised by a float, so as to do away with the use of a step. He further arranges the buckets and outside rim of the water wheel so as to form receptacles for the water in corners situated beyond the outlet slots of the rim. The water driving the wheel is thus provided with water cushions to bear against, and the motion of the wheel is rendered steady and continuous. Another prominent feature of the invention is a self-acting grate for the water outlet.

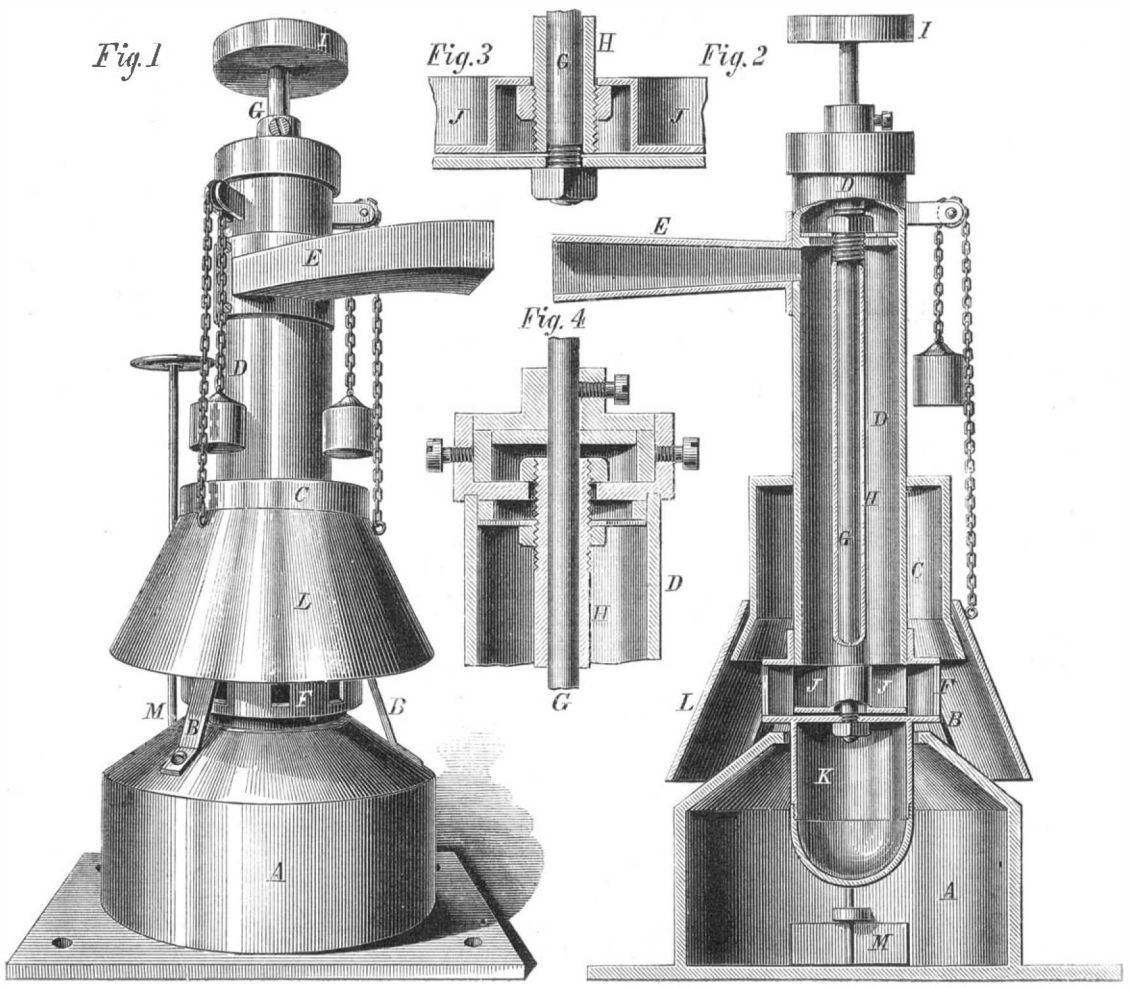


Fig. 1 is a perspective view of the complete apparatus, showing the water gate alluded to, fully raised. Fig. 2 is a sectional elevation of the same, with the gate nearly closed. A is a water cylinder on which are supported, by the legs, B, the cylindrical air chamber, C, and the inner cylindrical water tube, D. E is a horizontal pipe, through which the water is supplied. F is the water wheel, which consists of a disk-like plate at the bottom, an annular plate at the top (between which plates the buckets are inclosed), and an outer rim, slotted to discharge the water, as shown in Fig. 1. By means of the bottom plate it is mounted on the shaft, G, in the manner shown at Fig. 3, which represents a detail section of the hub. The shaft, G, extends upward through the long tube, H, and carries the driving pulley, I, at its top. The upper end of the tube, H, is screwed into a nut which rests upon the bottom of a cup or chamber placed upon the top of the water tube, D. The shaft, G, passes through this cup and carries over it a collar which bears against friction rings placed within the cup. The whole of this arrangement is shown in detail in Fig. 4. The lower end of the tube, H, carries the chute, J, which is contained within the annulus of the wheel, F. There are plates in the chute which run in the same direction as the buckets in the wheel, and which guide the water into the corners formed in the buckets before alluded to. From the bottom of the water wheel is suspended an air vessel which is shown at K.

The operation is as follows: The water received from the supply pipe passes down the water tube, D, through the chute, J, into the buckets of the wheel, F, and forces the air contained in the tube and wheel into the air chamber, C, where it reacts on the water and gives additional pressure upon it in the direction of the water outlet, which is formed by the flaring mouth of the gate, L, and the slanting top of the water cylinder, A.

The top of the water cylinder, A, is open. It is provided at the bottom with a pivot gate shown at M. Before escaping through the gate, L, the water rises in the cylinder, A, and by floating the air vessel, K, supports the chute, water wheel, and shaft. On making its escape, the water raises the gate, L, which is balanced by weights as shown in Fig. 1, to a hight proportionate to the power exerted by it. By varying the area of the water outlet, by means of this gate, the power of the wheel is regulated.

The use of the water support in lieu of a step, and the provision made for water cushions in the buckets of the wheel must result in very easy motion and place the wheel under complete control. For convenience, should repairs become necessary, the chute is constructed so that it may be raised in the water tube above the inlet; thus allowing room for a workman to descend the tube and do what may be required. Patented March 19, 1872. Further particulars may be obtained of the inventor at Proctorville, Vt.

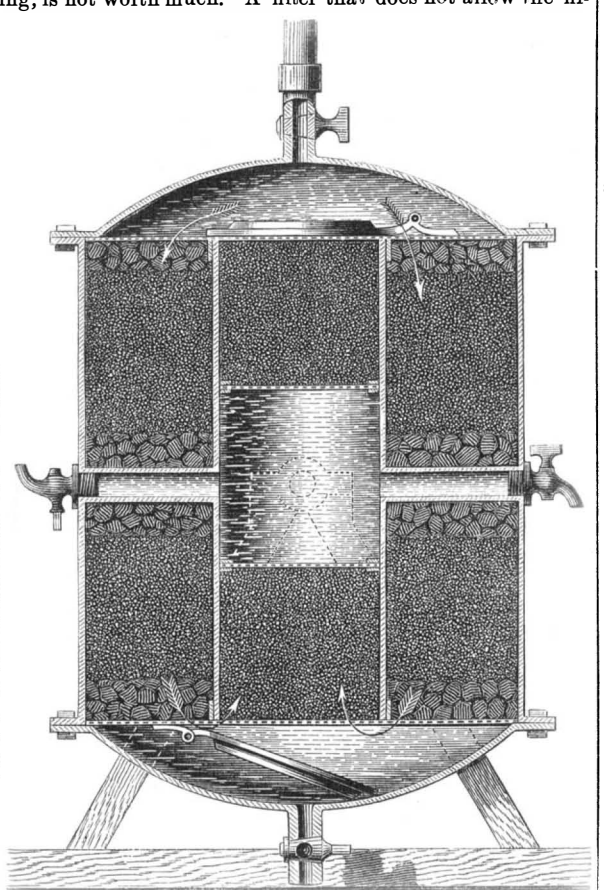
Paper from Wood.

Houghton's process is now being worked in England and on the Continent. The wood is cut up by mechanism into small bits, and then boiled in an alkaline solution. The pressure employed is 180 pounds to the square inch. The wood is introduced into the boiler in wire cages running upon a set of rails, so that, while one batch is being removed, another is ready for disintegration. When the boiling is completed, the small pieces of wood—which may be called fasces of wood fiber—are quite soft and of a dingy color, not dissimilar in appearance to a piece of rather coarse field rhubarb after it is cut up and baked in a pie. The material is now ready for bleaching in a vat, where it is treated with chlorine pumped into the liquor in such quantity as not to injure the fiber; and the operation is afterwards completed by the use of permanganate of soda. The condition of the material is that of a soft, pulpy, highly fiberous mass which, having been subjected to the action of a hydro-extractor, or, more simply, a "wringer," comes forth in the shape of a damp fleecy mass, in which only a microscopic eye could detect the pristine wood fiber.

The alkaline liquor, after the boiling, is of a clear brown color, about the tint of moderately strong tea, and is destined not to be thrown away as waste, but to be used again after the balance of the alkali absorbed by the fiber has been restored to it. This is effected by the use of sulphate of soda, so treated with coal as to produce a combined substance capable of restoring the necessary constituents. The material used for this purpose costs less than $25 per tun, and about 10 per cent of it will restore the lost alkali, for which it is substituted weight for weight—a trifling cost when compared with that of making up the deficiency with either caustic or carbonate of soda at the present prices. By this process, the liquor is made fit for reintroduction to the boiler, and on being removed is treated as before, so that it may be said to be constantly renewable.

REVERSIBLE WATER FILTER.

A filter that cannot be reversed, and thus made self-cleaning, is not worth much. A filter that does not allow the filtered water to rise, instead of falling, into the pure water chamber, is imperfect.



The accompanying engraving represents a filter adapted to all the purposes for which filters are used, which is essentially a self-cleaning filter, in which the water leaves all its sediment behind as it bubbles up into the pure water chamber in the center of the filter. The filter is supported on central trunnions in a wooden frame, and is turned, end for end, by simply detaching the supply pipe. The valves act by their own gravity as the filter is reversed. The perforated heads, which confine the filtering material and secures the central cylinder, are loose disks held in place by the outside heads. For further particulars address H. N. Taft, 18 Lafayette Place, New York city. This filter was patented Dec 26, 1871.

Sandspouts in Nevada.

For several hours yesterday there were visible from this city, on Twenty-two Mile Desert, five or six tall columns of sand, sucked up by as many whirlwinds. At sea these would have been waterspouts, but upon the desert they were only what we might call sandspouts. The columns appeared to be ten feet in diameter and one thousand feet in hight. Although they waltzed about over the plain for two or three hours, they never came together and never lost their distinctive cylindrical form, and when they did go down they went down at once—all falling together. These sandspouts are well known to all old prospectors, and seem to indicate a change of weather. We have frequently seen in the Forty Mile Desert, east of the lower Sink of the Carson, not less than ten or fifteen of these tall sand columns moving about over the plains at the same time. It is seldom that they come together, but when they do, they dart forward like two flashes of lightning, and an explosion like a heavy blast ends all, and the two columns of sand at once fall to the ground. Those who have not been upon our great deserts, and have never witnessed these grand sandspouts or the wonderful mirages, have but little idea of the romantic grandeur of these apparently uninteresting wastes of sand.—*Virginia (Nevada) Enterprise.*

A WATERSPOUT IN COLORADO.—The spout empties itself over a carriage and drowns two persons.—A remarkable waterspout occurred on the Central City stage road, four miles above Golden city, on Sunday afternoon, July 14. The torrent of water struck a carriage containing G. Vierden, his wife, her sister, and a girl named Blood, who reside five or six miles up the cañon and were returning home. The two latter were drowned. The body of Miss Vierden was found some three miles below the scene of the disaster, covered with sand and *débris*. The road was badly washed out and rendered impassable.

The Planet Venus.

At a recent meeting of the Royal Astronomical Society, a very interesting communication relative to the markings on the planet Venus was read by Mr. Langdon, a "station master" on one of the English railways. It appeared that the author, wishing to devote some portion of his leisure time to astronomy, became possessed of a 6 inch silvered glass reflector with which he observed the planet Venus from May to November, 1871. At first he had some difficulty in obtaining good views of the planet, but by inserting a diaphragm of card, perforated with a fine hole by means of a red hot needle, in the eyepiece, and thus shutting off all extraneous light, he brought the planet into perfect subjection, and pursued his observations with ease and comfort. Having read some time last spring that doubts had been cast on the existence of markings on the planet, he referred to his notes and sketches and compiled from them the paper now communicated. In May, 1871, he noticed a dull cloudy mark on Venus, which was seen by some men to whom he showed the planet. One of them, a mason, declared that the object he was looking at was the "moon," and he knew it to be so, because of the dark mark upon it. On one occasion Mr. Langdon saw the southern horn rounded off, the northern horn being quite sharp and ending in a fine needle-like point. On another occasion, both horns were sharp and pointed, and once the northern horn appeared bent and turned inwards towards the center of the disk of the planet. The appearance of the terminator is described as being jagged, very like the moon, but sometimes hazy; the author, comparing the moon's terminator to net work, said that of Venus appears like fine lace. Near the time of inferior conjunction, the dark body of the planet was well seen. In concluding his paper, Mr. Langdon returned his thanks to Messrs. Proctor, Norman Lockyer, Browning, and others for having sown the seed of knowledge broadcast, some of which he had picked up and endeavored to turn to account.

MAKE men intelligent and they become inventive.

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CHANGES OF CLIMATE.

The question whether the climate of different countries has changed since historical times can only be answered with certainty when we shall have collected correct meteorological observations of several centuries. It is well known, however, that the invention of the thermometer was only made in comparatively recent times, and that only since the latter part of the last century regular observations have been commenced in regard to the temperature of different localities.

Glaisher, however, claims already to be able to determine, by the observations made in England, that a gradual rise of the mean temperature is taking place there. He finds, indeed, that from 1770 to 1800, the main temperature of the year was 8·72° Centigrade; 1800 to 1829, 9·17°; 1830 to 1860, 9·44°. According to Dove, the yearly mean temperature of Berlin, Prussia, from 1848 to 1865, differs only $\frac{1}{100}$ of a degree from that of the 137 years before that time.

According to Professor Loomis, the mean temperature of New Haven was, from 1778 till 1820, 7·60° C. and for 1830 to 1865, only 7·52° C., showing a gradual cooling.

Such results are, however, by no means reliable, because it cannot be proved that the instruments used during the different periods agreed exactly; and they may have been placed in different circumstances.

If, therefore, we wish at the present day to decide if any changes have taken place in the climate during, say, twenty centuries, nothing is left but to enquire if changes have taken place in the *flora* and *fauna* of the country in question.

The fossil remains of plants and animals show the most enormous changes since geological times; indeed, changes so great as to make a climate, once tropical, at present temperate or even polar. And this suggests the question of slighter changes visible in modifications in the *flora*.

From the fact that in Palestine, at the present day, the vine and the date palm tree are cultivated one next to the other, as we know was the case 3,300 years ago, Arago concludes that the climate there cannot have changed at all during that period. If ever, during that period, the mean temperature had risen a few degrees, the cultivation of the vine would at once have ceased; if, on the other hand, the mean temperature had descended a few degrees, the date palm trees would all have come to an untimely end. For similar reasons, Arago holds that the climate of Egypt, Greece, and Italy has not changed, while Biot proved the same for China, deducing it from the study of the Chinese records, which are very complete in regard to the condition of that country during past centuries.

In the meantime, it appears that several other countries show a decrease of temperature. For it is proved that in many regions of France and Germany the vine was cultivated many centuries ago where now it has been abandoned, for reason that the grapes do not attain full maturity. However we do not consider this as an argument as the abandonment of this culture, in localities not well adapted and which produced only sour wines, is not to be wondered at when, by the improvement in intercommunication, it became more economical to obtain good wines from elsewhere than to make poor wines at home.

In the Alpine region, however, there are many facts which point to a gradual descent of temperature and deterioration of the climate. So it has been proved that, in the former centuries, the Alpine glaciers were less extensive than at present. In the second half of the sixteenth century, people went to church from Wallis to Grindelwald, along a road which at present is entirely covered with ice. A chapel, which is marked on Schopf's map in 1570, was destroyed by the glaciers in the beginning of the seventeenth century, and its place is now covered by a glacier. The bell from this chapel, with the year of its manufacture cast in it, namely 1044, is to the present day preserved in Grindelwald.

At Guhannen, in the Hasli Thal, hemp used to be cultivated; this is at the present day, by reason of the early snow falls, utterly impossible.

Formerly the Engstlen Alp was covered with cattle from the 21st of June; since the beginning of this century, it is not possible to take possession before July, while the retreat in the fall must also be made some eight or ten days earlier.

There is also no doubt but that the upper limits of the mountain forests are many hundreds of feet lower than formerly; as, high above the present limits where all forest growth is at present arrested, there are found the remains of old forests, dead trunks, enormous roots, and other relics, witnessing a prior very vigorous vegetation.

It is evident that such changes must be the result of a lowering of the mean temperature of the country in general, so that, so far as concerns these mountain regions, a gradual cooling appears actually to be taking place.

THE CHIRONECTES PICTUS.

During the voyage of exploration of Professor Agassiz last winter to the West Indies, there was hauled on board of the *Hassler* one day a ball of gulf sea weed, in bulk about that of the two fists, which excited the especial attention of the Professor from the peculiar manner in which it was rolled up. On being placed in a bowl of water, it soon became evident that the ball was a nest of some kind, but what animal could have made it, and to what class it belonged, was the question. This was soon settled by the magnifying powers of a good lens. The sea weeds were bound together by numerous little elastic threads, which were uniformly beaded; and on examination of the beads under the lens, they were found to consist of embryo fishes, and exhibited the usual large eyes upon the side of the head and a tail bent over the back of the body, just like the embryo of ordinary fishes shortly before hatching. Some of the beads were placed in jars, and in a few days they had hatched out and become quite lively, when the Professor was enabled to ascertain, from the study of their pigment cells, that they were the progeny of the *chironectes pictus*, or fish having hand-like fins.

By the favor of Captain Fisher, of the schooner *Isabella*, we have just received, in good order, from Mr. P. W. Humphreys, of the Aransas Pass lighthouse, Texas, a specimen of these singular fishes, which, he states, was picked up from a bunch of sea weed at the above place. The specimen is three inches in length, has irregular, black stripes, and is indeed a queer looking fish.

As its name indicates, says Professor Agassiz, "it has fins like hands; that is to say, the pectoral fins are supported by a kind of prolonged, wrist-like appendages, and the rays of the ventrals are not unlike rude fingers. With these limbs, these fishes have long been known to attach themselves to sea weed, and rather to walk than to swim in their natural element. But now that we have become acquainted with their mode of reproduction, it may fairly be asked if the most important use to which their peculiarly constructed fins are put is not probably in building their nests."

DRAWINGS OF THE PATENTS.

We are glad to be able to state that the *Official Gazette* of the Patent Office, in which the Claims are now printed, is to be hereafter illustrated with the drawings of the patents, done on a reduced scale by the photo-lithographic process. The public will thus be placed in possession, at a cheap rate, of complete copies of the drawings of the patents, together with incomplete copies of the specifications. Part of a loaf is better than no bread, says the adage, and therefore we suppose we ought to be thankful for fragments of the patents. We trust, however, that Congress will now go a little further and order the printing of the entire specifications, instead of the mere tail ends which are now given. In the compact type, now used in the *Gazette*, only about two thirds more space will be occupied if the full specifications are printed, while the work will be rendered infinitely more creditable and valuable. By the full printing of all the patents in this manner, applicants will be enabled to inform themselves readily as to what has been previously done in any particular line of invention, much litigation will be avoided, and the general business of the Patent Office will be simplified.

A DECISION BY THE COMMISSIONER OF PATENTS.

"Where a device, though simple, saves time and labor, and is not anticipated, the grant of a patent is warranted."

The above simple and reasonable proposition was laid down by Commissioner Leggett in a recent appeal to him from a decision by the Board of Examiners-in-Chief.

It appears that George Richardson applied for a patent for an improvement in bobbins, which consisted in simply making a couple of holes through it so that the bobbin spindle could be conveniently oiled. The primary examiner rejected the case on the ground, first, that the invention lacked utility—was good for nothing; second, that it lacked novelty, it being common, and not an invention, to make oil holes in machinery.

The Board of Examiners-in-Chief coincided with this view, and assumed, furthermore, that there was no need for the holes, as the oiling could be just as easily done by removing the bobbin from the spindle; they were also of opinion that the oil would exude from the holes and injure the yarn upon the bobbin; the holes were therefore a damage and not an improvement.

In reply to these objections, it was shown by the applicant that, in practice, the oil did not exude, that his improvement saved time and labor in oiling and was therefore useful, and that as the examiner had been unable to produce a reference to a similar device, it was proper to assume that it was novel. The two conditions of patentability being thus established, namely, *novelty and utility*, the applicant asked that the patent might be allowed.

Commissioner Leggett granted the petition, reversed both of the decisions of the examiners, ordered a patent to be issued, and laid down for the guidance of examiners the sterling proposition here repeated: "*Where a device, though simple, saves time and labor, and is not anticipated, the grant of a patent is warranted.*"

This maxim is clear and correct. It ought to be painted in conspicuous letters, in blue and gold, upon the walls of all the apartments occupied by the examiners-in chief and the primary examiners, as a constant reminder to duty. It seems to be difficult for some of these officers to remember that their first and most important function is to assist and encourage inventors by the granting of patents. Instead of doing this, they frequently commit the folly of improperly rejecting their cases; and in the study of excuses for maintaining such rejections, they are apt to exhibit more ingenuity than is found in the invention which they reject.

AIDS TO VENTILATION.

We have frequently called attention to the importance of heated flues as assistants in the ventilation of buildings, apartments, etc. It is proposed in Glasgow to connect the main street sewers with the chimneys of the principal manufacturing establishments, and thus to establish an upward draft from the sewers which shall carry off the foul gases that otherwise would escape into the streets. This is practical and may be easily effected. The employment of chimney drafts for such purpose is very simple and effective. We observe by a paragraph in the Oneida *Circular* that this plan has been adopted by the Oneida Community, with complete success, in the ventilation of their water closet apartments. Almost every other ventilating expedient had been tried without really satisfactory results. But as soon as the apartments were connected with the chimney, no further trouble was experienced. One of the earliest uses of this method that we remember to have seen was at the Asylum for the Insane at Hartford, Conn., where it has been in operation for many years. Dr. Butler, the able superintendent of that Institution, had always experienced great difficulty in maintaining a pure atmosphere in the vicinity of the closets until he introduced pipes beneath the seats, which were made to communicate with an adjacent chimney. A draft up through the chimney was thus made, whereby the foul odors were entirely carried off.

In New York and other cities, nearly all the private dwellings are invaded by sickening odors from the sewers, which find their way up through the house drains in spite of the best arranged traps. This difficulty may be easily overcome by extending a small pipe from a point just below the usual trap into the nearest fire chimney. The pestilent gases will thus escape into the chimney instead of into the house. Such connections ought to be made in every dwelling house where drain pipes are used, and the faithful architect will see that they are included in the specifications.

TESTING ARMORED TURRETS.—A REMARKABLE EXPERIMENT.

The English Board of Admiralty has recently inaugurated a series of tests for the definite determination of the merits of the turret or Monitor system as a means of harbor defence.

The *Glatton*, the vessel selected as a target, is one of the latest specimens of British naval architecture designed by Mr. E. J. Reed, late Chief Constructor of the British Navy. Her length is 264 feet, breadth 54 feet and draft 19 feet. She is raised out of water 3 feet, which can be reduced to 2 feet by flooding. Her tunnage is 2,700 tuns. Her guns are contained in a single turret which is considered the heaviest and strongest afloat.

The object of the experiment, which took place July 5, was to determine whether, by the impact of a 600 pound shot propelled by a 12 inch rifled gun, this turret could be jammed, or prevented from working. There was also to be ascertained the probable damage that might be caused to the guns and other interior fittings of the turret.

The armor plating of the latter against which the shot was to be thrown consisted of, first, one rolled covering of iron 15 inches in thickness, disposed over the circumference of the outer face of the turret in two tiers, and secured to the backing and inner skin by four and a half inch india rubber washer-headed bolts. Behind this armor plating there is 14 inches of teak, then an inner skin formed of two six-eighth inch iron plates, and a quarter inch iron plating over the nuts on the tails of the bolts holding the armor plates. The turret wall is further strengthened, structurally, by two horizontal girders or frames, forming two shelves to the teak backing from the inner skin, each formed of three quarter inch boiler plate and 10 inches in depth.

The gun used was one of the 25 tun 12 inch muzzle-loading Fraser guns made at the Woolwich Arsenal. The projectiles selected were the Palliser 600 lb. shot, solid and chill headed and the powder charge was 85 lbs. large pebble. The vessel carrying the gun, the *Hotspur*, was moored at a distance of

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200 yards from and on nearly a parallel line with the *Glatton*. In the turret of the latter, a kid, a rabbit and a fat hen were placed to try the effects of concussion.

The weather in Portland Roads, the locality selected, was in every way favorable. After a few trial shots, the first projectile was aimed at a mark on the extreme upper edge of the turret; but the sighting was untrue and the huge mass of iron skimmed over the top of the turret.

A second shot soon followed, striking the turret armor in its weakest part, in the center of the turret wall, upon a bolt head and upon the lower edge of the upper 14 inch armor plate at its longitudinal junction with the lower plate. It lifted the upper plate, or rather forced it upward and over the face of the backing, until its lower edge was separated from the upper edge of the lower plate to a distance of 2½ inches, the upper edge of the lower plate where the shot penetrated being depressed nearly one inch by the sheer downward force of the shot.

The fracture extended upwards from the plate's lower edge in a three quarter circle form, measuring 17 inches vertically and nearly 20 inches along the plate's edge. Other effects of the shot's work outside the turret were seen in the broken-off head of the bolt struck, a starting apart of the plates in three longitudinal and vertical joints in the immediate vicinity of the blow, and also a starting of the two plates between the gun ports in their vertical jointing. Inside the turret, the inner end of the bolt struck by the shot was found to have driven in and fractured the inner skin or iron lining, its nut breaking off and lodging upon one of the trunnions of the starboard gun.

The depth of penetration was 15 inches. Still, with all the immense striking force of the shot, estimated at a little over 6,100 tuns, there was no through penetration, and the turret was found to revolve with the same facility as before the shot was fired. None of the gun fittings or gear was injured in any way. The kid, the rabbit, and the hen looked dazed, but they had sustained no other injury.

The second shot fired at the turret was lower than intended, taking the glacis plate in its entire breadth, making a deep indentation and cracking the plate through. From the plate the shot struck the bottom of the turret plating, penetrated to a depth of 15 inches, and then rebounded broken up on to the deck in front of the turret. The inner skin of the turret was not even bulged. This was thought quite sufficient as establishing, in the most indisputable manner, the free working of the turret under the heaviest fire without much danger of being jammed or of damage to the gun slides. The three unwilling occupants of the turret had also suffered no injury.

We are indebted to the London *Times* for the foregoing particulars.

THE DECREASE OF OUR FISH SUPPLY.

During the summer of 1871, Professor Spencer Baird, of the Smithsonian Institute, was authorized by Congress to examine into the state of the National fisheries and to determine definitely the question as to whether the fish indegenous to our waters were decreasing in number or not. After careful investigations, made principally along the Eastern shore of Massachusetts, the Professor has found that such diminution is constantly taking place, and that since 1860 fully nine tenths of the fish have disappeared from our fishing stations. This depreciation has been general, except in the matter of blue fish which, from the time of their appearance in 1847, have increased rapidly and are now as abundant as ever they were.

To account for this decrease, it was held by many that the food on which the fish subsisted had disappeared; and to ascertain the truth of the assertion, dredges were drawn over mussel beds, and the water in various parts of the bays and ocean was examined to see if it contained much animal life. The results obtained proved that the bivalves, crustaceans and similar creatures existed in great abundance on the bottom, while the water was literally teeming with infusoria, polyps, jelly fish and other animal matter; thus affording positive evidence that such varieties of fish as were bottom feeders or slow swimmers had around them more food than they could possibly consume.

Attention was next directed to the modes of destruction employed, and it was discovered that to the pound net was due the principal part of the decrease of fish. But sixty of these nets are in use along the entire New England coast, and they take almost all the fish that are captured. They have ruined the hook and line fishermen, nearly driven the fykemen out of the business, and now, having sole possession of the ground, control the supply of the market. The catch is often numerous; four men will manage a pound net with a leader of a mile in length, and the catch of a single period of six hours has frequently been as large as one thousand blue fish, or an equal quantity of other varieties, which realize to the net men only about a cent a pound. Professor Baird, after examining all the different devices for capturing fish, decided that the mode above described was the most destructive in use.

The increase of blue fish is another cause to which the diminution in numbers of the smaller fry may be ascribed. The former have augmented considerably, and the oil factories having destroyed the menhaden (their natural food) in vast numbers, they have been forced to feed on killies, porgies, young weak fish, striped bass and young shad. Professor Baird reports that these ravenous creatures fed even after they were in the pounds, and filled their stomachs with small fry which were along shore and which they could not have found in their accustomed haunts. He also states that, if the manufacture of menhaden oil were discontinued, the bluefish would be satisfied with the comparatively worthless food; but with their natural supply cut off, they have to seek support on fish that are more valuable than themselves.

The world of science in general is indebted to Professor Baird for the superb series of photographs, some eighty in number, which he has taken of the various species of fish examined by him. It has been customary heretofore to hang up the fish by a string or nail, the consequences being that its shape became distorted, and its natural proportions and form were lost. In this case, however, each fish was carefully laid on white paper and the camera arranged vertically above it. Then by pinning out the fins and placing a marked rule beside it, the Professor obtained an accurate photograph of the specimen, showing shape, size and characteristics. The scientific distinctions such as lateral lines, fin rays and divisions of the operculum are clearly represented, and can be more easily examined on these photographs than on the originals themselves.

We trust that our next Congress will take measures to arrest this alarming diminution of one of the most useful and valuable of our food supplies. If we consider how largely on fish and on their capture the livelihood of that portion of population dwelling on our coasts depends, the importance of the question will be appreciated and the necessity of some action by the General Government apparent.

[Special Correspondence of the Scientific American.]

LETTER FROM PROFESSOR R. H. THURSTON.

PITTSBURGH, Pa., June 25th, 1872.

The Inclined Railway and the Iron City. Coal, iron, and glass production. The puddling furnaces and iron rolling mills of Pittsburgh. Cold rolled iron, how it is produced. Manufacture of railway rails.

This city of Pittsburgh is well named "the Iron City." Climbing the neighboring hills, or, better, riding up in the cars of the Inclined Plane Company, on the Birmingham side of the Monongahela, the city, spread out below us, between and on both sides of the two rivers (the Monongahela and the Alleghany) can sometimes scarcely be seen through the drifting clouds of smoke from its hundreds of furnaces. The city is really composed of three municipalities, which will probably, ere long, be united in government as they are now in interest. Pittsburgh in the middle, with Birmingham and Alleghany on either side, together make up a total of, probably, 210,000 people who are principally supported by the work done here in working iron and in making glass.

IRON, GLASS, AND COAL STATISTICS OF PITTSBURGH.

The amount of iron made in the vicinity is not great, but the amount worked into plate, bars, rails and other "uses" is at present not far from 350,000 tuns per annum. There are nearly 600 puddling furnaces here, and roll trains of sufficient capacity to work off the product of these furnaces. The total number of rolling mills is about 45, and there are 75 founderies and machine shops which work over about 150,000 tuns of metal. The rapidity of the growth of the manufactures of Pittsburgh may be judged by the fact that the increase during the past eight or nine years, or since the effect of the first stimulus of our civil war began to be observed here, has amounted to nearly 200 per cent.

The production of glass has increased in nearly an equal ratio and now employs about 5,000 workpeople.

About 150,000,000 bushels of coal are mined near here, and the oil trade of the city foots up to about $12,000,000, per year.

THE FURNACES.

Although there are not very many blast furnaces running, those lately erected are of large size and are fitted with every valuable improvement that may be found in leading iron making districts at home or abroad. We visited, with the able professor of chemistry of the Western University of Pennsylvania, the Isabella furnaces, and were exceedingly pleased with their design and the arrangement of the plant. From the top of these great towers, which are 75 feet high and 20 feet in interior diameter, we obtained a fine view of the surrounding country, and, riding up on the smoothly working "air hoist," made the ascent without fatigue. Each of these furnaces is expected, when running up to its full capacity, to make 65 tuns of iron a day.

One of the most noticeable iron mills of Pittsburgh is that of Messrs. Lyon, Short & Co. The celebrated Sligo iron, which is so well known all over the country, is made here. This iron is probably not excelled by any in the world in strength, toughness, and uniformity, and "equal to Sligo" is a phrase that usually means much more than can safely be promised of other irons. The ore from which this iron is derived is found in middle Pennsylvania, among the Alleghanies, and it is smelted and to some extent puddled at the mines. The superiority of the iron is due to the excellence of ore and fuel, and perhaps quite as much, also, to the extraordinary care taken, from beginning to end of every process of its manufacture, to preserve it from injury by contamination with impurities or by carelessness in manipulation. The only noticeable peculiarity in working, aside from those mentioned, is that all iron made here goes under a very heavy hammer where it is very carefully worked before going to the rolls.

We found at these mills a well selected little library for the workmen, which gave good evidence of having been generally used, and a fine collection of samples of ores and metals, also placed where the workmen could reach them.

The great care taken here to secure the most scrupulous attention in every detail, and to the importance of doing careful and honest work, is fully equalled by the care taken to raise the character of the employees, securing steady industrious men and offering them every opportunity to improve themselves. These workmen, and I find the same characteristic in some degree of those in other establishments here, very generally are members of building associations, and their desire to invest their savings in real estate is one of the most pleasing and encouraging evidences of their intelligence and thrift.

MESSRS. JONES AND LAUGHLIN'S WORKS.

We had the pleasure of visiting the mills of Messrs. Jones & Laughlin, and of witnessing the manufacture of the cold rolled shafting. After rolling their shafting hot to nearly the size required when finished, it is carefully freed from scale and the reduction to finished size is accomplished by cold rolling. The shafting leaves the rolls with a beautifully smooth surface, perfectly round and wonderfully uniform in section, fitting Whitworth gages as accurately as the most carefully made lathe work. The most singular result of undergoing this process is a great increase in strength and stiffness, although the density is not appreciably changed.

The shafting is not rolled sufficiently to give it the immense accession of strength and stiffness, mentioned by Sir William Fairbairn in the account of his experiments, as that, at present prices, would probably be hardly remunerative; but for equal sizes it is far stronger and stiffer than any turned shafting, and the best evidence of this is the fact that a market is readily found for the ten or twelve tuns per day that comes from the rolls.

Another article of production in the cold rolling mills is the "finger bar" of mowing machines, of which immense numbers are made. They are found to be stiffer and more perfectly elastic than steel, and to possess the additional very great advantage of being as easily worked as the best of iron.

The light trains of rolls in the "new mill" are driven by belts from overhead shafting—a novel method of driving rolls.

These works are very extensive, containing 83 puddling furnaces and producing from 150 to 175 tuns of metal per day, as the result of the labor, in all departments, of 2,500 men. The rail trains, making rails weighing from 8 to 40 pounds per yard (for mines), and the nail machines dispose of that part of the puddled iron which does not go into the cold rolling mills.

The works are very conveniently arranged and the character of the work done in the cold rolling department is marvellously perfect.

MESSRS. PARK'S WORKS.

The steel works of Park Brothers interested us very much, not in consequence of the novelty of the processes in use, but as exhibiting another illustration of the fact, noticed at the Sligo Mills, that the most well known among manufacturers of the higher grades of iron and steel, owe their reputation to the skill and honest painstaking with which they have worked long known methods.

Here the iron is carefully chosen from among the best brands, worked carefully, and thoroughly inspected as it comes forth after each process, and none gets into market, as first quality steel, that is not really of the highest grade.

Considerable quantities are made for manufacturers of dentists' tools, a use to which only the very finest and strongest of steel can be put. Every one, who has ever been so unfortunate as to fall into the hands of a dentist, probably wonders how the art of man can produce such metal as that of which his instruments are made; slender as a needle, frequently, yet sustaining almost the weight of the operator while cutting the enamel of the tooth, the hardest substance found in organic nature. Here in Pittsburgh, we learn that the condition of success in its manufacture is the combination of the highest skill with the most scrupulous attention to each detail in the process.

This firm make large quantities of "low" steel for steam boilers, and are at present making some sheet steel for the great bridge across the Mississippi at St. Louis. R. H. T.

CHEAP RAILWAYS.

The advocates of narrow gage railways in this country, who seek to adopt the three feet gage as the standard, will do well to examine the plans of Mr. Fell, who has lately constructed and put in successful operation, at Aldershot, Eng., a railway of 18 inches gage, on which siege guns of seven tuns weight are easily transported. This railway, one mile in length, was constructed in 45 days. It is built on posts, in order to obtain the necessary levels, and cost $10,000 per mile. From the accounts given, it seems practicable to do nearly as much business on an 18 inch railway of this description as on the 3 feet road.

The concurrent opinion of the narrow gage people, at the recent St. Louis convention, was, that a 3 feet railway could be built for about half the cost of the 4 feet 8½ gage, which is the ordinary measure, and that therefore the 3 feet gage ought to have the preference.

The Wotton railway in England, 7 miles in length, having the usual 4 feet 8½ inch gage, cost only $7,200 per mile. It was built for light traffic, and proves to be very serviceable. The narrow gage estimates are usually higher than the cost of the Wotton railway.

M. HARTING, of Utrecht, has designed an instrument under the name of *physometer*, primarily for the purpose of rendering visible and measurable the variations in the air volume of a fish's air bladder during life, but applicable also for the determination of any changes in volume of a body, such, for instance, as those of the muscles under contraction, or those of caoutchouc under extension.

IT is proposed to construct fourteen new French ships of war. Of these, two will be armor plated vessels of the first rank, and two others will be armor plated monitors.

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SCIENTIFIC AND PRACTICAL INFORMATION.

CHOLESTERIN.

This curious organic substance was first obtained by Conradi in 1775, from the so-called bile stone. Its chemical composition is represented by the formula C_{26} H_{44} O. It is a white, tasteless, inodorous substance, insoluble in water, sparingly soluble in cold alcohol, but easily soluble in boiling alcohol which, on cooling, deposits beautiful crystaline nacreous *laminæ*, soft to the touch and melting at 278·6° Fah. It is also soluble in ether, wood spirit, oil of turpentine, soap water, and neutral fats. A solution of cholesterin, in two volumes of alcohol and one volume ether, deposits, by spontaneous evaporation, laminated transparent crystals of hydrate of cholesterin (C_{26} H_{44} O+H_2 O).

Cholesterin resists the action of concentrated alkaline solutions at boiling heat, but lime decomposes it at 482° Fah.; hydrogen is given off and the cholesterin converted into an amorphous fatty body, nearly insoluble in alcohol. When strong sulphuric acid is gradually added to a slightly heated mixture of cholesterin and dilute sulphuric acid, it becomes soft, acquires a deep red color, and decomposes, giving off all its oxygen in the form of water.

Cholesterin is converted by the action of nitric acid into *cholesteric acid*, C_8 H_{10} O_5.

A biluary calculus, or bile stone, composed of nearly pure cholesterin and beautifully crystallized, was recently found in the smaller intestines of Mr. V. M. Griswold, a well known photographic chemist of Peekskill, N. Y. At the time of his death, this obstruction had reached an enormous size, being an inch in its smallest diameter, two inches long and five inches in its longest circumference. Mr. Griswold had been confined to his bed but four days, and died in the greatest agony.

LEAD GLAZING IN STONE AND EARTHENWARE.

It is well known that a lead glaze has long been used as a glazing for pottery. The danger to which the workmen are subjected in its use ought, before this, to have consigned it to that *limbo* whence no lost art returns. The dust given off by grinding the lead oxide is breathed by the workman, is brought into contact with him as a slimy mass floating on water when he dips the pot in glazing, and he absorbs its vapors while the vessels are burning. Hence it is that potters and manufacturers of earthenware frequently suffer from lead colic, which often proves fatal. A glazing, free from lead, has been invented and used by Alois Klammerth, of Znaim, Moravia, Germany, which, it is hoped, will save the lives of hundreds of workmen now sacrificed on the leaden altar. His glaze consists of two thirds of fusible brick clay, and one third of a clay which contains a large quantity of ocher or iron ore, the whole mixed with 8 parts of ley from wood ashes. This glazing, although requiring a high temperature in the burning, is so firm as to resist the action of mineral fully as well as glass. The operation is very simple and the results so satisfactory, after a six years' trial, that the process may already be called success, and not only are users of the ware safe against the insidious and cumulative poison, but the workmen too are safe from all danger in its use.

A New Objection to Patent Laws.

It has been our lot from time to time to hear a great many objections, good, bad, and indifferent, against the existence of a patent law, but it could only have occurred to a Scotchman to start what we have lately become familiar with under other circumstances as "the religious difficulty." During the sittings of the late Parliamentary Committee on Patents, Mr. Macfie, the well known advocate for abolition of patent right, managed on every possible occasion to bore his colleagues on the committee, and to puzzle the witnesses by making a long speech embodying his particular views in the guise of a question. One of the persons under examination happened to use the word "steal" in reference to those persons who used an invention without paying royalty to the inventor. Mr. Macfie was down upon the unfortunate witness in the following manner (Question 2250): "You use the word 'steal,' but I think God, in His providential arrangements, has so constituted mankind that one receives the benefit of that which another discovers, and *I think that the patent laws have a tendency to interfere with those divine arrangements;* I look on the patent laws as facilitating a denial to the nation of that which in their absence they would enjoy; do you really think the word 'steal' appropriate ?" We have ventured to italacise a portion of this extraordinary "question," which places the matter in an entirely new light. With the fear of Exeter Hall before our eyes, let us remove the foul blot from our statute book without a moment's delay.—*Engineering.*

High Heeled Boots for Ladies.

A London surgeon, Mr. P. Hewlett, reports several cases of serious fractures of limbs indirectly caused by these heels, which had tripped up their wearers; and he refers also to the distortion and injury to the foot that they often induce. He says: "Last year I was sent for to see a young lady in one of our London hotels. She wished to consult me about her foot. On seeing it I thought its state depended upon her boots, and I asked to see them. The boots were brought in by the lady's maid, but the only thing I could observe about them was the immensely high heels. I said: 'It is the high heels of your boots that cause the mischief, and unless you diminish them I can do nothing for you.' She became quite angry, and said she could not alter them. 'I cannot do it and will not.' Suddenly she again toned down, and said: Pray, sir, what would people say if they saw me walking about the park without high heels?' I said: 'It is simply heels *versus* brains. If you have brains, you will cut off the heels; if you have no brains, you will continue to wear them.' She fortunately had brains, cut off the heels, and her foot got quite well."

GROWTH OF NAILS.—M. Dufour has made observations as to the rate of growth of the nails. Here are some of the results: The nails of the little fingers grow more slowly than those of the other fingers and the thumbs. The difference is about one ninth. The mean rate of these (excluding the little fingers) is about one millimeter (100th part of an inch) in ten days. The rate of growth on the thumbs is probably greater than that on the six longer fingers. There is little difference between the rates of growth in different animals, The nails grow at about the same rate on both hands. The rate of growth is not constant throughout the length of the nail; it is greater near the base. The rate of growth at the side parts is probably the same as in the middle part. The substance of the nail advances equally throughout its breadth. The rate of nail growth in an individual at intervals of several years shows sensible differences.

DEACON'S METHOD OF OBTAINING CHLORINE.—The process consists in passing a heated mixture of air and hydrochloric acid over sulphate of copper, or over pieces of pumice or brick saturated with the same. He finds that the action is essentially a surface action, and that there is a certain comparatively small range of temperature, between the critical limits of which the percentage of hydrochloric acid decomposed varies greatly. The velocity with which the mixed gases pass over the surface of the active material also causes considerable variation in the comparative amount of chlorine produced.

WE are asked by our correspondents for the addresses of makers of round leads for pencils and for a good book on the subject, for a good printing ink at 25 cents a pound, the price of a one horse power caloric engine, where to get a small brass engine of sufficient capacity to run a sewing machine or churn, and many other articles, for introducing which to the public our advertising columns are always open.

A NOVEL ESCAPE FROM PRISON.—A prisoner in the New York city prison, possessed of some medical knowledge, recently conceived the idea of producing artificial small pox for the purpose of being removed to Bellevue Hospital, where he would have a good chance for escape. He touched his face over in spots with croton oil, which quickly produced pustules. He was regarded as a small pox patient by Dr. Nealis, removed from prison and sent to the hospital, whence he duly made his escape. Four other persons confined in the prison then tried the same game, but were detected and remanded to their cells.

"LONGFELLOW," the fastest racing horse in America, was badly injured, during a race at Saratoga Springs, July 16th. One of his racing shoes became twisted and cut the adjoining foot and leg. It was a three mile race, with "Harry Bassett." Longfellow had made 2¼ miles in 3 min. and 59 sec.—the fastest time on record—when the accident occurred, and Bassett came in one length ahead.

A PATENT has lately been granted to B. F. Day, of Hazleton, Pa., for the separation of slate from coal by means of an ascending column of water. The lighter mineral is carried off by the water while the heavier, descends through the water. An apparatus working on this principle, for separating diamonds from other pebbles, has been in use for several years.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed four Lines, One Dollar and a Half per Line will be charged.

Dry Steam, dries green lumber in 2 days; tobacco, in 3 hours; and is the best House Furnace. H. G. Bulkley, Patentee, Cleveland, Ohio.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4 00 a year. Advertisements 17c. a line.

Apple Grinders—The Best Machine can be had by addressing Watson Barr, Ypsilanti, Mich.

It is better to purchase one of the American Twist Drill Company's Celebrated Patent Emery Grinders than to wish you had.

Wanted—A situation as foreman of a boiler-shop—has had over twenty years' experience in the construction of locomotive, marine, and stationary boilers. Has been, until quite recently, foreman of the boiler-shops in a leading manufacturing establishment. Address "Boiler Maker," Rail Road Gazette, 72 Broadway, New York City.

Spring Bed, Bed Spring, Fanning Mill, and Thrashing Machine Manufacturers. Send circulars to H. Ogborn, Richmond, Ind.

Jewels for all secret societies, badges for all kinds of business, plated and lettered at wholesale prices. Die sinking, mould making. Send model or pencil sketch. Waterman & Co., Box 57, West Meriden, Ct.

Band Saw Mills.—I wish to communicate with parties engaged in the manufacture of Band Saw Mills for sawing lumber from the round log, also with parties who have such mills in successful operation. R. F. Learned, Natchez, Miss.

Blake's Belt Studs. The best fastening for Leather or Rubber Belts. 40,000 manufacturers use them. Greene, Tweed & Co., 18 Park Place, New York.

New Style Testing Machines—Patented Scales. Send for New Illustrated Catalogue. Riehlé Brothers, 9th and Coates Streets, Philadelphia, Pa.

Flouring Mill near St. Louis, Mo., for Sale. See back page.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and reset by J. Dickinson, 64 Nassau st., New York.

State Rights on improved Cigar Moulds for Sale. Patented June 25, 1872. Inquire of Isaac Guthman, Morrison, White Side Co., Ills.

For Machinists' Tools and Supplies of every description, address Kelly, Howell & Ludwig, 917 Market Street, Philadelphia, Pa.

A traveling agent throughout Germany, Austria, and Switzerland, offers his services. Address A. D. P., 71 Essex Street, New York.

The best recipes on all subjects in the National Recipe Book Post paid, $2.00. Michigan Publishing Company, Battle Creek, Mich.

The official report of the Master Mechanics' Association will be published in full in the RAILROAD GAZETTE, 72 Broadway, New York, beginning July 6. Send $1.00 for 3 months' subscription.

We will Remove and Prevent Scale in any Steam Boiler or make no Charge. Two Valuable Patents for Sale. Geo. W. Lord, Phila., Pa.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

Walrus Leather for Polishing Steel, Brass, and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

For Marble Floor Tile, address G. Barney, Swanton, Vt.

Upright Drills—The best in the world. Built by Hawes Machine Co., Fall River, Mass. Send for Circular.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company, foot East 9th Street, New York—1202 N. 2d Street, St. Louis.

Three fourths saving of fuel, by the Ellis Vapor Engine (Bisulphide of Carbon) in running the Haskins Machine Co's Works, Fitchburg, Mass. To whom apply.

Old Furniture Factory for Sale. A. B., care Jones Scale Works, Binghamton, N. Y.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Steel Castings to pattern, strong and tough. Can be forged and tempered. Address Collins & Co., 212 Water Street, New York.

The Waters Perfect Steam Engine Governor is manufactured by the Haskins Machine Co., Fitchburgh, Mass.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

Portable Baths. Address Portable Bath Co., Sag Harbor, N.Y.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. P. Andrews & Bro, 414 Water st., N.Y.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 36 Dey St., New York, for descriptive pamphlet.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Better than the Best—Davis' Patent Recording Steam Gauge. Simple and Cheap. New York Steam Gauge Co., 46 Cortlandt St., N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

For hand fire engines, address Rumsey & Co., Seneca Falls, N.Y

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—HARDENING SOAP.—What is the best thing with which to harden soap?—D. D.

2.—TESTING BOILERS BY HYDRAULIC PRESSURE.—How can I apply hydraulic power as a test to a boiler, which is intended to carry 100 pounds of steam to the square inch?—F. M. C.

3.—REMOVING THE CRUST OF SHELLS.—Can any of your readers inform me how to remove the outside crust of sea shells so as to show the natural color of the shell?—R. J.

4.—SAND PUMPING.—In your article of July 13, referring to the East River bridge, you say sand was discharged at a depth of 60 feet (removed from the caisson) by means of the air system through a 3½ inch pipe continuously. Will some one please explain the operation of the air system?—W. E. F.

5.—METAL DRILLING.—With what shaped point should small drills (from one thirty-second to one fourth of an inch) be made to make them cut the fastest and best, or to "take" into the metal most rapidly? I have an upright foot power drill, and usually the piece of iron to be drilled is the same thickness as the diameter of drill. Should they be made square and sharp pointed, or flat like a cold chisel or a common twist drill?—H. V.

6.—ELECTRICAL MACHINE.—Are there positive and negative poles to the induced current of an electrical machine such as is used by doctors? If there are, how can I tell which is which? Also, how must I make the coil so that, when the wire bolt is out entirely, I cannot feel any current?—R. P. P.

7.—PERMANENT MARKS IN ELECTRO-CHEMICAL TELEGRAPHY.—How can the marks on electro-chemical telegraph paper, which is moistened with solution of iodide of potassium, be made permanent and the paper be protected from the action of ozone which releases the iodine, coloring the paper and obliterating the marks? Should the liquid in which the paper is moistened be a saturated solution of iodide of potassium? The solution must be very sensitive to the passage of the current.—G. B. M.

8.—RHUMKORFF COIL.—I want to make a Rhumkorff coil that will give a three or four inch spark. I wish to know: 1st. The size, length and insulation of wire (iron or copper?) in primary coil, and whether it should be put on in one or more pieces. 2nd. Size and amount of wire (iron or copper?) in secondary circuit, and how insulated? 3d. The manner of constructing condenser, and how connected to the coil. 4th. What length shall I make it? I have made several small ones, but the effect is not proportionate to the amount of material used. So I want to proceed with the next one in a systematic way.—R. R.

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Facts for the Ladies.—Mrs. H. B. Taylor, Putnam, Ohio, has used her Wheeler & Wilson Lock Stitch Machine 14 years without repairs. In two weeks she earned with it $40, besides doing her own housework; has stitched 80 yards in less than 2 hours. See the new Improvements and Wood's Lock-Stitch Ripper.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

F. C., of Dayton, O., has bestowed much thought on a contrivance for repeating by sound the matter on a printed or written paper. His first idea was to have letters printed in a conducting ink on a non-conducting material, and exhibit them by passing over the surface a metallic comb, connected with a wire; but he has since suggested the reflection of an ordinary book page or manuscript on to a plate chemically prepared, so that the writing or dark part of the reflection may etch through the film to the metal. Over this etched plate, a metal comb could be passed, indicating every completion of the circuit, and the signals could be read from a telegraph sounder or transferred to a specially constructed instrument with a keyboard. There is much ingenuity in our correspondent's elaboration of his idea, described by him in detail; but we cannot altogether agree with him in considering such an invention to be "of vast importance and infinite advantage." Mr. F. C.'s idea is "that a machine of this kind could read to multitudes," but we question whether the multitudes would not prefer the readily available human voice, of which the language is already known, and which speaks without any elaborate apparatus, however ingeniously constructed. The same inventor proposes to accelerate our speed in walking by attaching to our feet roller skates, the rollers being ratcheted to prevent their going backwards; also to make transparent paper "by forcing oil into the pores by a sand blast." The use of the sand blast must be considered superfluous, as paper and textile fabrics are only too accessible to the action of greasy matter, and no difficulty in saturating them has ever been found. Another suggestion is a plow with teeth acting in front of the machine to scratch up the soil and throw it backwards, an enlarged illustration of the mode of procedure of that indefatigable soil breaker, the hen. These, with one or two for increasing the buoyancy of ships, for teaching drawing, etc., show the diverse directions in which our correspondent's talent finds exercise.

F. W. H. asks: Can you inform me what will remove the stain which nitric acid makes upon green rep? The stain is upon the green rep covering of a sofa. Answer: There is no help for you. The nitric acid has destroyed the pigment and it cannot be restored. Stains made by sulphuric acid on such goods can be removed by ammonia. In such cases the sulphuric acid unites with the pigment and forms a compound. When ammonia is applied, the sulphuric acid unites with the ammonia and the pigment resumes its former condition. But nitric acid utterly destroys the pigment.

LOCOMOTIVE SPEED ON A DOWN GRADE.—To E. O. R.—Yes; a grade could be so steep that the engine would run down it at a greater speed than the steam would drive it on a level.

PROPELLING CANAL BOATS.—To R. P. P.—We have published many suggestions similar to yours, some of which we have illustrated.

CLEARING SNOW FROM RAILROAD TRACKS.—Has steam ever been tried for melting snow on railroad tracks? H. J. Answer: Yes; and it is found to be a rather expensive way of getting rid of the snow.

To W. B., of Ohio.—The specimen you send is galena or lead ore, the source of all the lead of commerce.

LARD IN TIN CANS.—In answer to W. H. C., query 2, page 416, Vol. XXVI., I would say that if the lard has no salt in it, tin cans are best to keep it in. Many of the pork houses in Canada use tin cans altogether.—H. J., of Mich.

COLORING IVORY.—To E. S. H., query 3, page 26, current volume.—Wash the balls free from grease, and steep for a few minutes in a dilute solution of muriate of tin; take out and rinse in clean water, and then put them into a clear infusion of cochineal, to which a little ammonia has been added. When of the proper color, take out, wash and dry, and polish with a piece of dry flannel.—E. H. H., of Mass.

SHOEMAKER'S INK.—To L. R., query 6, page 26, current volume.—Make a strong decoction of logwood, and add to it a very small quantity of chromate of potash.—E. H. H., of Msss.

COLORING LINSEED OIL.—To J. P. W., query 1, page 41, current volume.—For a red color, add alkanet root and digest with heat. Probably the addition of a little turmeric root to the red oil will give a brown.—E. H. H., of Mass.

SKIN DISEASES.—C. N., query 7, page 41, current volume.—In my capacity as a physician, I would say to C. N. and his friends that it would be ill advised on the part of any professional man to prescribe for an eruption as spoken of. It would be necessary to know the occupation of the patient, and the possible presence of some special irritant; the appearance of the eruption; whether attended with much inflammation; whether of a dry and scaly character or the reverse; the state of the general health, and so on. Eruptions result from, and are very much influenced by, constitutional causes, as well as from some mechanical or chemical irritants. Knowing the causes and symptoms, the medical man will be able to make a correct diagnosis, and be able to prescribe with a fair certainty of effecting a cure.—E. H. H., of Mass.

TORCHES FOR NIGHT FISHING.—B. J. is informed that, in the Eastern States, the use of pitch pine torches has been discarded within the past few years and kerosene lamps substituted with much success. A large lantern with reflector—something like a locomotive head light—is used. The fishermen find it far more convenient, economical, and useful than the torch such as B. J. describes.—A. E.

BLASTING UNDER WATER.—In answer to A. H. P., query 12, page 10, current volume, I send the following very simple plan: Use a tin cartridge of proper size, with a tube of length sufficient to bring it above the water. Charge the cartridge through the tube, and then insert a fuse and you are ready for work.—C. H. M.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

BOILER CONSTRUCTION.—W. H. C.
CHOLERA AND SUN SPOTS.—J. L. N.
DAILY WEATHER BULLETIN.—D.
ELEGY ON THE LATE PROFESSOR MORSE.—J. T. S.
EXTINGUISHING FIRES.—J. A. N.
LAND DRAINAGE.—A. S. P.
LEGAL WISDOM.—T. H.
THE SEVEN DEGREE SYSTEM.—J. B.
VACUUM IN CASKS.—X.
WEIGHT, PRESSURE, ETC.—B. O.
ANSWERS TO CORRESPONDENTS.—P. E. McD.—F. E. M.—E. J. L.—C. O.—B. D. H.
NOTES AND QUERIES.—L. C. K.—M. McK.—J. W. S.

A Hint to the Working Man.—A man with a family, however poor he may be, owes it to his wife to save her health and strength in every way possible. He has no right to allow the mother of his children to wear her life out toiling with her needle to clothe her family. His duty is to buy the New Wilson Under-Feed Sewing Machine, the best machine for family sewing ever invented, and he can buy one for fifty dollars. More than this, he can buy the Wilson machine upon terms which enable him to pay for it in small monthly installments, that he can spare out of his wages without feeling the drain. He will get thereby a machine capable of doing every variety of family work in the most beautiful manner, a machine that even a child can operate, and which will prove a permanent family blessing. Salesroom, 707 Broadway, N.Y.; also for sale in all other cities in the U.S.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

VENTILATOR.—Edward M. Greenway, Jr., of Baltimore, Md.—This invention relates to a new ventilator and air filter to be applied in the wall or in the windows or window frames of buildings; and consists in the arrangement of a box which is open to the outer air and to that within the house, and contains, between perforated sieves, one or more layers of cotton fiber. This fiber is known as the most perfect air filter, and by its use the air for human consumption is freed from dust, insects, organic cells, contagious germs, and other noxious material.

PLOW.—John Fox, of Oskaloosa, Iowa.—This invention is an improvement in the mode of attaching plows to wheeled axles, and consists in constructing and arranging the parts composing the clamping device and the plow coupling, so that the latter or the draft line is below the axle; the arrangement being also such that the plows can be adjusted to run deeper or shallower, as desired.

DOUGH KNEADER AND ROLLER.—Washington A. Snow, of Killingworth Conn.—This invention furnishes an improved machine for kneading and rolling dough, which is easily adjusted so as to roll the dough thick or thin, as may be required; it consists of a kneading board and rollers operated by suitable gearing. The dough is placed upon the board, which is moved backward and forward, and its thinness is determined by adjusting the frame of the machine.

BASE BURNING COOKING STOVE.—Andrew J. Caywood, of Poughkeepsie N. Y.—This invention consists of an elongated fire pot and a correspondingdingly shaped upper portion of the case or shell, in one end of which the magazine is arranged; the other end is utilized for a series of ovens which are placed one above the other. The lower oven has pot holes with covers in the bottom. and is directly exposed to the fire below and may be used for cooking on. It also comprises a series of ovens in a case above the top of the stove case proper, which are suitable for drying purposes, and a detachable foot rest for supporting the feet to warm, receiving the drip in a trough. and conducting it into the pit below the fire.

WASHING MACHINE.—Clark Turner, of Triangle, N. Y.—This invention furnishes an improved washing machine which consists of a box at the bottom of which is pivoted a frame carrying two rollers; against these the clothes are pressed and rubbed by a revolving cylinder arranged above them. Springs are arranged so as to hold the rubbing parts together firmly, and yet allow for varying thicknesses of clothes.

DEVICE FOR MENDING BROKEN SPOKES IN VEHICLE WHEELS.—Andrew J, Caywood, of Poughkeepsie, N. Y.—In this invention the broken spoke is joined by a screw threaded sleeve to one end of a screw rod or tube, the other end of which is inserted in the felloe and prevented turning therein by means of a projecting rib.

ORE SEPARATOR.—Frederik Cazin, of Frumet, Miss.—This invention relates to improvements in the arrangement of the actuating plunger sieve and operating mechanism of an apparatus for separating crushed and screened mineral rock, according to the specific gravity—that is, separating the several kinds of pure ore from the waste rock. It consists in a plunger which is arranged parallel to a row of sieves and pivoted at one end, so that the force or effect of its stroke upon the water is gradually increased thence to its free end. It also consists in arranging a slotted arm with the wrist pin of the driving shaft and the rod that connects with the plunger, so that the down stroke of the plunger is quicker than its up stroke.

WINDMILL.—Ovett B. Knapp, of Brandon, Wis.—This invention consists of a windmill which is provided with a tail for keeping the wheel to the wind and apparatus for automatically turning said tail to take the wind or not when it is desired to start or stop the mill; and also with another tail for turning the wheel edgewise to the wind when it is to be stopped. It also consists of a peculiar arrangement of the automatic shifting apparatus for the principal tail.

FOLDING FRAME FOR TENT.—Franklin A. Guthrie, of Addison, Ohio.—This invention furnishes an improved folding tent frame with sleeping berths, which is simple and strong in construction, light, and capable of being folded in a small compass, so that it may be conveniently transported from place to place.

WAGON BRAKE.—William D. Johnston, of Harrisville, Pa.—This invention consists in the arrangement of a locking mechanism with the brake and tongue of a vehicle in such a manner that, as the wagon, in going down hill, presses forward, the resistance of the tongue operates certain levers and connecting rods, and applies the brake with a power proportioned to the force with which the wagon presses forward. By the construction the wagon can be backed without applying the brake.

SAW CLAMP.—Thomas L. Kenworthy, of Collinsville, Ohio, assignor to himself and Armstrong Tweedy, of same place.—This improved saw clamp is made of two upright frames, the top side of which form the jaw. They are connected near the top by adjustable cross bars, and they are spread apart, as required, at the bottom by a frame which is pivoted to one of the upright frames and presses against the other. In this way the saw is tightly clamped along its whole length, and as the arrangement is portable may be readily placed in a position to obtain the best light.

IRON FOR WHIFFLETREES AND NECK YOKES.—James Wood, of Lockport, N. Y.—This invention relates to the construction of the ferrules or caps and the ring or hooks of neck yokes and whiffletrees for wagons and other vehicles; and it consists in casting the hooks or rings into the lugs of the caps or ferrules instead of welding them in.

FENCE PANEL ADJUTSER.—Francis M. Ranous, of Yreka, Cal.—This invention is an improved device for forming an adjustable connection between the rails and posts of fences so that shrinkage or swelling of the timber may be compensated. It consists in a mortised socket which is attached to the post, and a hollow tenon which is fastened on to the end of the rail. The tenon is placed in the mortise of the socket, and the two are connected and adjusted by a right and left screw.

WATCH CASE SPRING.—James L. Wilson, of Woodstock, Canada.—This invention consists of an improved arrangement for preventing dust and foreign substances generally from finding their way through the case of the watch when the lid is opened, which object is accomplished by constructing the finger attached to the hinged case so as to make it fill the hole in the lower plate and close it up completely when raised.

COOKING STOVE.—Jackson Barnes, of Burlington, Vt., assignor to himself and A. C. Tuttle, of same place.—This invention relates to new and useful improvements in stoves for domestic use or cooking, and consists in such a construction and arrangement of the parts that the vapor and gases generated in the process of cooking are not allowed to escape into the apartment, but are conducted with the unconsumed gases to the chimney.

GIN SAW SHARPENER.—James McBride, of Lilesville, N. C.—This invention furnishes an improved machine for filing or sharpening the teeth of gin saws while upon the mandrel or shaft; it is simple and convenient in use, being so constructed as to give the proper form to the teeth and to hold the saw firmly and steadily while they are being operated on while it can be easily moved from one tooth to another.

PROCESS OF HARDENING EDGE TOOLS.—Leverett W. Stuart, Hawley, Pa.—The invention consists in a process of hardening edge tools by applying an edge face thereof under pressure against a revolving smooth faced metallic wheel.

CARRIAGE WHEEL HUB.—Jesse B. Bauman, Shepherdstown, Pa.—The invention consists chiefly in the combination of a wooden hub having a central row of spoke mortises arranged in a zig zag line, with two lateral clamping plates or collars which are provided with internal tampering lugs or projections, forming when applied to the hub mortises or sockets for receiving and clamping the spokes. The second part of the invention consists in the manner of attaching the clamping plates to the hub by imbedding or countersinking the horizontal flanges formed thereon into the surface of the same and then securing them in place by bands driven over them.

BRAKE FOR WAREHOUSE ELEVATOR.—Martin G. Gill and Claude L. Gill, Baltimore, Md.—The invention consists in a peculiar mode of connecting the brake lever with a hand lever that is pivoted to the platform frame of an elevator, whereby a person standing thereon can apply it readily at any story or distance from the first floor.

MAGAZINE FIRE ARM.—Andrew Burgess, Oswego, N. Y.—This weapon is a breech loader. The metallic or shell cartridges are inserted at the side, and elevated so as to be driven into the breech by a device operated by the breech block. The lever guard and breech block are formed in one piece, and the latter has lateral projections that fit and work in grooves formed in the bed piece and running at right angles to each other. The cartridge extractors are arranged in the horizontal grooves and are connected with the said projections so as to be moved forward and back simultaneously with the breech block. The hammer is set by means of a small rod or bar which connects it with the breech block. This arm is formed of few parts, and is little liable to get out of order; it may also be cheaply constructed and is very efficient.

POTATO DIGGER.—Julian Farlow, Harrison, Ind.—The invention consists in a potato digger with the teeth placed in a lever frame that is arranged on the axle of a two wheeled vehicle.

MINING PICK.—John Pearce, Barton, Md.—The invention consists in supporting and preventing the handle of a miner's pick from splitting, by means of a socket, while the portion around the eye is left thick and in its full strength to take the strain of percussion without cracking the metal.

COTTON CULTIVATOR.—Wilson Baker, Memphis, Tenn.—The invention relates to a means for scraping and chopping out cotton, which is a slow and tedious operation but must be performed once on every crop and in such a way as to leave plants in a row. The invention consists in cutting away at one operation a certain portion of soil from each side of a ridge by means of two plows, and clearing the edges with scrapers, while a double circular and revolving cutter makes two parallel lines, one on either side of the row, and also prevents clods or trash from falling on the young plants.

DOOR FOR MINES.—This invention provides means whereby the doors in the passages of mines are automatically opened and closed by the cars approaching and leaving the same, thereby saving time and labor in the operation of the cars. It consists in connecting the door by ropes or chains with links that slide on rails which are fitted into the sides of the mine passages. A car approaching a door comes in contact with one of these links and pushes it along, thereby actuating the rope so that the door is opened. After having passed the door, the car strikes the other link and moves it ahead, so as to shut the door behind it. The tracks for the links are bent at the ends toward the sides of the passage, to allow the links to be swung out of contact of the car when they have been moved the requisite distance. Mathias Jensen, of Carbon Station, Wyoming Territory, is the inventor of this improvement.

CLOTHES WRINGER.—Thomas G. U. Fisk, of Macon City, Mo.—This invention consists of a novel arrangement of levers. and a weight, or spring, with the rollers; whereby the requisite pressure is obtained on the rollers, and at the same time such a wide range of movement of the one roller toward and from the other is allowed that the action is alike, or nearly so, upon small quantities or large masses of clothes, and the increased pressure common to rollers governed by screws and the springs of the common arrangements is avoided, and the necessity of gearing the rollers together by cogs is obviated. It also consists of a long cam shaped clamping roller, which is combined with the frame in such a manner as to fasten the frame to the tub readily.

APPARATUS FOR DISTILLING.—Heinrich Druding, of Brieg, Prussia, assignor to Ewald Schmidt, of Hudson City, N. J.—This invention relates to a new distilling apparatus, which has for its object to obtain the largest practicable yield of spirits in the shortest time from a given quantity of mash; and which is more economical in its operation than the devices for the same purpose now in use. It consists in a new arrangement of mashing apparatus, rectifying column, condenser, and cooler, and various other improvements which we have not space to describe in detail.

SWITCH STAND.—Patrick Carrigan, of Sturgeon, Mo.—This invention provides an improved self acting latch for switches, which can also be used as a handle to move the lever. It consists of a latch which is hinged to the side of the lever and operates to lock the same by means of a projecting pin which passes through holes in the lever and its stand. Upon raising the hinged latch by its handle, the pin is withdrawn and the lever unlocked. Upon bringing the lever into its proper position, the holes in it and the stand are brought in juxtaposition and the latch falls of its own weight, and the pin passes through the holes and effects the locking.

CART TONGUE SUPPORT.—Elbert J. Weed, of Stamford, Conn.—The object of this invention is to provide an improved device for supporting the tongue of the common ox-cart, and it consists in forming the support of two bars which are pivoted by their upper ends to the sides of a wedge shaped block. This block is attached to a hanger (which is rigidly bolted to the under side of the tongue) by a bolt or rivet, so that it can play thereon or turn to the right or left. Arranged in this manner, the supports can be inclined so as to brace in either direction, forward, back, or laterally, according to the inclination of the cart to move and the surface of the ground. When not in use, the supports are turned up to the under side of the tongue, where they are held by an iron bail.

RECIPROCATING STEAM ENGINE.—Samuel Smith, of Little Rock, Arkansas.—The object of this invention is, if necessary, to convert the slide valve of an engine into the working piston, and thereby to permit the repair or replacing of the main cylinder, piston, or connection without arresting the action of the machine. It consists mainly of three cylinders placed side by side. The first contains the piston proper, the second a slide valve consisting of two disks mounted on a rod, and the third a cut off valve. When the piston proper is in action, these parts perform their natural functions. When, however, the first cylinder is to be thrown out of action, it is shut, together with the space between the disks of the slide valve, entirely out of steam connections. Channels are opened which allow the steam to act on the slide valve disks as on an ordinary piston, and the cut off operates as a slide valve in connection therewith.

SCOURING BOX.—Warren W. Langdon, of New Hampton, Iowa.—This invention furnishes an improved box for containing the materials required for scouring knives, etc., and is constructed so that its opened door serves as a platform upon which the knives are scoured, while the contained scouring materials are placed within easy reach.

TOY GUN.—George Stackhouse, of Mount Washington, Pa.—This invention relates to a new toy gun, in which the trigger is connected with a crank shaft, which carries a swinging target in such manner that the target is brought to view whenever the trigger is drawn back, but withdrawn when the trigger is let go. The child can therefore always see a target to practice on without having any chance of hitting and destroying it.

NEEDLE THREADER FOR SEWING MACHINES.—John C. Vittum, of Pittsburgh, Pa.—This invention consists of an instrument similar in form to a pair of nippers, but with the handles so pivoted that the jaws are caused to pinch together with a spring. These jaws have grooves for griping the needle, situate perpendicular to the handles, and other grooves, for introducing the thread, traverse them. An adjustable gage is set to act in connection with the needle post so as to insure the needle being griped by the first grooves with its eye in a line with the threading grooves. The threading is thus rendered sure and easy.

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PIPE JOINT.—William H. Hammond, of Tipton, Iowa.—This invention relates to a new manner of coupling stove, water, and other pipes at angles or in straight lines. For angular joints, the coupling consists of two flanged metal plates which are riveted to the sections of pipe by their flanges and joined by a tubular screw at their centers. For straight joints, a notched, flanged ring is riveted to one section of the pipe, and the other is provided with hooks which are passed through the notches and made to overlap the flange.

TOOL FOR DRESSING MORTISES.—Charles E. Littlefield, of Carver's Harbor, Maine.—This invention furnishes an improved tool which is so constructed as to adapt it for such work as has been heretofore done with the chisel, such as squaring mortises, etc., and it consists in a planing tool, which is formed of a stock, of appropriate size for entering the mortise, which carries the plane iron near one end and a straight handle at the other. The plane iron is made the same width as the stock and the tool is therefore enabled to cut close up to an angle or line.

FLOUR SIFTER.—Thomas I. Fontaine, of New Madrid, Mo.—This invention furnishes an improved flour sifter, and consists of a frame and box attached thereto, which latter is adapted to receive sieves of varying fineness; also of a cam and shaft by which reciprocating motion is given to the same.

WASHING MACHINE.—Jacob J. Smith and Charles B. Camp, of Middlebury, Ind.—This invention furnishes an improved washing machine which is simple, convenient, and inexpensive; it is so constructed that it may be secured to the bottom of an ordinary washtub, and it consists in the arrangement of corrugated rollers in a suitable frame, between which the clothes are passed to be washed.

LATCH FOR GATES.—George N. Sharp, of La Plata, Mo.—This invention consists of a catch of peculiar construction which admits of various modes of operation by means of a lever connected therewith. Provision is also made to work this lever from the inside of the gate by means of a spring push bar which passes through the gate post.

BUCKLE.—Jerome B. R. Hardeman, of Tehuacana, Texas, assignor to himself and E. W. Foster, of same place.—This invention relates to a new buckle, which is provided with two tongues on the same pivot, and with a guard for securing the same and the straps in position, by which means a simple and reliable fastening is produced.

FOLDING WASH BASIN.—Charles J. Nesbitt, of Plattsburg, Mo.—This invention consists of a wash bowl or other like vessel whose sides and bottom are made of sections of metal or other suitable substance, which are connected by leather, india rubber, or other flexible material, in such a manner that the basin can be readily folded up into a small, compact bundle, thus forming a useful and convenient article for travellers and others.

HOOP.—This invention furnishes a new article of manufacture in the form of hoops for pails, tubs, and analogous receptacles, and it consists in constructing hoop iron with semicircular cuts or tongues pointing alternately in opposite directions, which tongues are indented in the wood, after the hoop is driven on, by means of a punch and hammer. By this means the hoop is held in position, should it become loose even by the shrinking of the wood. Edward Hill, of Orange, Mass., is the inventor of this improvement.

VAULT COVER.—Theodore Hyatt, of New York city.—This invention relates to a new and useful improvement in covers for vault lights, whereby ventilation is obtained by simply raising the cover, without removing it from its bed plate. It consists mainly of an annular bed plate with a bar across its under side, and a cover for the same. A thumb screw passes up through the bar and is connected by a socket with the under side of the cover. By means of this thumb screw the cover is fastened down, or elevated so as to leave an annular aperture for ventilation.

CUTTING APPARATUS FOR HARVESTERS.—Calvin D. Read, of Ayer, Mass.—In this invention the construction of fingers and finger bars for mowing machines is simplified. The bar is rolled metal, of a peculiar form of cross section, and is notched at its front and provided with an upwardly projecting perforated flange at its back. Each finger is cut by one operation from plate steel, and is so formed as to enter a notch in the bar and conform to its peculiar figure; it is fastened to the bar by screwing a nut on to its rear end which passes through the flange.

CHURN.—Charles Harvey, of Cairo, N. Y.—In this invention, the dasher rod of a plunge churn is connected by a pitman and crank with a shaft carrying a balance wheel, and motion is given to the shaft by a second crank to which is attached a vertically sliding rod. This rod is provided with a handle above and a foot piece below by means of which the operator actuates the machine. By this construction, the churn is worked mainly by the foot and weight of the body, and the operation is, consequently, less fatiguing than when performed in the ordinary manner.

APPARATUS FOR STIPPLING METAL SURFACES.—Richard Dimes, of New York city, assignor to Tiffany and Co., of same place.—This invention is more especially intended for stippling and dressing the surfaces of silver ware, but it is applicable to the stippling of all kinds of metallic surfaces, and imparts thereto a frosted or a matted or a brightened finish as may be desired. The improved device is composed of a series of stippling points, made of metal or other material, which are loosely jointed to and swing from a chuck or mandrel that revolves with such rapidity as to cause the points to fly out radially from their chuck; so that when any metallic surface is brought into contact with them it becomes indented or stippled by their action.

PRESERVING MEATS, FISH, ETC.—Bartolomé Mosquera, of Santiago, Chili.—This invention provides a chemical solution by the use of which meats and fish are preserved in a fresh condition for any length of time. The meat may be either kept immersed in the liquid, or dried after an immersion of some hours.

AUTOMATIC FAN.—Joseph Ménonval Belcour, of Paris, France.—In this invention spring mechanism is placed within a box and is employed to produce vibratory motion in a tube which projects from the center of its top. A fan is held in the tube and by its waving motion cools the air in its vicinity.

KNITTING MACHINE NEEDLES.—Nathan H. Baldwin, Laconia, N. H.—This invention consists in certain improvements in the construction of knitting needles, by which their bulk is reduced so as to make them capable of doing finer work than ordinary.

PROCESS FOR PRINTING FABRICS.—Edouard A. D. Guichard, Paris, France.—This invention refers to a new process of printing on fabrics of all sorts, such as silk, wool, cotton, hemp, flax, etc., whether they are woven in combination with one another or separately, and it consists in the addition of certain compounds to the ordinary colors, by the aid of which they can be imprinted direct, without previous preparation of the fabrics, or after washing and fixing of the colors.

WIND WHEEL.—John Wirnek, Lake Mills, Wis.—This invention consists of a vertically revolving wheel on a horizontal axis, with the vanes or blades on the spokes, which are pivoted so as to turn on their own axes. The spokes are arranged tangentially to a circle which is considerably larger than a grooved hub at the center, and they have segmental toothed arms at right angles to them, on the inner ends, which gear with said hub. This hub is connected with two fans at the tail, which are forced together when the wind is strong, in such a manner as to turn the blades of the wheel to receive less wind. When the wind is slack, the blades are moved outward by a weight.

THREAD GUARD AND CUTTER FOR SPOOLS.—Lewis P. Laffray, Amsterdam, N. Y.—In this invention a small flat plate of metal is fastened by projecting points to the end of the ordinary thread spool. It has a notch near the periphery of the spool and a clip on its face, which are so arranged that the end of the thread may be readily held by them so as to prevent unwinding. The device also operates as a thread cutter or breaker.

RING TWINE CUTTER.—Lewis P. Laffray, Amsterdam, N. Y.—This invention furnishes an improved ring twine cutter which is designed to be worn on the forefinger of the left hand. It consists in pivoting a curved knife or cutter in a groove of the finger ring, and providing the same with a spring and thumb piece by which it is raised out of the groove and brought into position for use.

MOLDING MACHINE.—James S. Dewing, Orange, Mass.—This invention consists of an ingenious combination of a revolving table with a horizontal and two vertical cutters, all of which are adjustable; by means of which curved work can be turned in ogee form, or with any kind of grooves on the face, and various other operations performed which could not be done by the old apparatus. The machine is also readily adaptable for planing or cutting straight moldings.

CHAIN PROPELLER FOR CANAL BOATS.—Edwin T. Ligon, Demopolis, Ala.—This invention relates to endless chain canal boat propellers, and has special reference to the mode of forming the buckets and applying them to the endless wire ropes or cables. The improved buckets are composed of short sections of rubber tubes enclosed in metal tubes. The rubber tube is bound or secured to the cable by means of wire, or other suitable means; and the metal tube, which is of the same length, is formed with an internal screw thread and screwed upon the rubber tube, thus forcing the rubber to take a firm hold of and adapt itself to the form of the cable, so as to retain its position while passing through the water. The metal tube or cylinder also protects the rubber from the wear or injury to which it would otherwise be exposed.

WATER METER.—William Van Anden, Poughkeepsie, N. Y.—This invention consists in combining, with the water wheel of a meter, an auxiliary adjustable wheel, by means of which the pitch of the buckets is varied and the speed regulated without incurring loss of time in setting them to correspond with the measuring and recording apparatus. It also provides a water passage to the upper journal and its bearing, by which the same are lubricated, and simplifies the construction generally.

CAR COUPLING.—Alfred J. Jourde, Houston, Texas.—This invention furnishes an improved car coupling, which is so constructed as to couple the cars automatically as they are run together, hold them securely coupled when upon the track, and uncouple them automatically should one or more of the cars run off the track or capsize.

BUSTLE.—Amos W. Thomas, Philadelphia, Pa.—This invention improves the construction of bustles or tournures of the class in which horizontal bows are connected with a continuous or circular rim, and consists, mainly, in the arrangement of braces for supporting the bustle upon the hips of the wearer.

MACHINE FOR MOLDING FLOWER POTS AND OTHER POTTERY.—Friedrich Herrmann, Milwaukee, Wis.—This invention relates to improved apparatus for manufacturing flower pots and other articles of pottery, and consists of a machine constructed so as to form the flower pot by the action of a mold and plunger, which latter is operated by a lever. A movable bottom, in combination with the mold, and other devices form part of the invention.

ARCH BRIDGE.—John Zellweger, Louisville, Ky.—This invention relates to a new manner of stiffening the two halves of the arches in an arch bridge, and to the proportionate distribution of the weight over the same. The improvements consist in connecting the middle of the arch to a point in its chord near the end of the bridge, and certainly within one third of the span, by a strut tie or crown brace, which is again connected by diagonals with the arch; and in further combining the system thus formed with a series of rigid uprights. By this construction two trusses are combined with the natural supporting line of the arch, and the material and cost reduced.

PLOW.—Glover G. Foreman, Stockton, Ga.—This invention pertains to the combination of a notched or perforated adjusting bar with the plow or shovel standards and a cross bar, which latter is pivoted to the draft beam, so that, when it is turned on its pivot, the standards, and with them the plows or shovels, are turned to keep them in proper position with reference to the line of motion or the desired operation on the soil. The arrangement appears to be effective as well as simple.

MUSICAL INSTRUMENT.—William Standing, Sr., Du Quoin, Ill.—This invention consists of a musical instrument in which the sounds are produced by air forced into a series of glass tubes which are made with contracted necks at one end and are closed at the other; they are graduated in size and length. It also consists in tuning them by means of glass stoppers or plugs, with which their ends are closed, and by which the length of the tube is determined.

SPITTOON.—John Hillin, Poughkeepsie, N. Y.—This invention furnishes an improved spittoon which is simple in construction and convenient in use; it is made without any hole in the side, and with the conical or funnel shaped part detachable. It is packed with rubber so as to prevent the contents being spilled, should it be overturned.

HOT AIR FURNACE.—Johnston Mealey, Ogdensburg, N. Y.—This invention is an improvement in hot air furnaces made principally of brick, more especially upon that patented by John Gwynn, May 8, 1869. It consists in so arranging the heating and combustion chambers, etc., that the cold air is divided into two currents, one of which passes up through the center of the furnace, and the other between the outer and inner walls, after which they unite in an inner chamber, between two combustion passages, before being discharged.

TRACE DETACHING WHIFFLETREE.—Robert P. Sims, Mexico, Mo.—This invention relates to a new whiffletree attachment for suddenly disconnecting the traces in case the horses run away or become shy. It consists in such a combination with the whiffletree of a pivoted trace holder and spring locking lever that, by pulling the lever, the trace holder is released and swings around its pivot, thereby instantly detaching the outer trace; the whiffletree then swings round and becomes detached from the inner trace.

DOUGH MIXER.—William Edward Damant, of West Hoboken, N. J.—This invention relates to a new machine for properly mixing, agitating, and shaking dough and paste for bakers or confectioners. It consists, first, in the use for the mixing purpose of two screws, which revolve in opposite directions and are twisted in reverse order, so that they not only agitate, but feed the matter to be acted upon. The invention also consists in the use of a sliding platform, upon which the dough is discharged by the screws and which is so lightly supported on rollers that it is moved ahead by the dough emerging from the machine.

CLOTHES DRYER.—Anson W. Phillips, of Fairfield, N. Y.—This invention furnishes an improved clothes bar or dryer, which is so constructed that it may be conveniently and compactly folded up out of the way, even without taking down the clothes; it consists in the following construction: A hollow standard is supported by two cross bars at its bottom, to which it is pivoted. A vertical iron rod is inserted in the top of the standard, and on it are placed, one above another, sleeves from which the arms to carry the clothes project. By this arrangement the lower cross bars and the arms, with the clothes on them, may be turned in any required direction so as to dry the clothes or be out of the way.

DEVICE FOR PREVENTING BACKLASH IN MILLS.—Alexis B. Rider, of Fairfield, Ill.—This invention consists in connecting the spur wheels of flouring mills and other machinery, wherever it may be required, to the shaft by means of wooden springs, in such a manner that the springs take up the backlash and thereby avoid the irregularity due to the positive connection of such wheels. Wood springs are much better for this particular use than metal springs, because, as they are not required to yield so much as to demand the greater elasticity of metal, the greater resistance of the wood against breaking force is made available.

FLORAL ORNAMENT.—Henry James Rogers, St. Denis, Md.—The invention consists in a metallic flower holder with one or more compressible soft metal tubes attached by a strip or hook, whereby the stems are clamped in the tubes and firmly held.

CAR COUPLING.—Samuel K. Paden, Pulaski, Pa.—The invention consists in a car coupling provided with a reciprocally fastening and double grapple which is unlocked by depression exerted from the platform, and has a lateral play adapting it to curves.

COMBINED HEADER THRESHERAND SEPARATOR.—John H. Robbins, Bethel, Oregon.—The invention consists in applying to a combined harvester a header which is braced against backward motion while it is allowed an upward front and side movement through a double joint, in connecting with an extension of the header a very simple mechanism which places said header under the complete control of the driver, and finally in means for exactly adjusting the throw of the rod which connects the pitman with the cutter bar, so as to prevent said rod from bumping against the guide.

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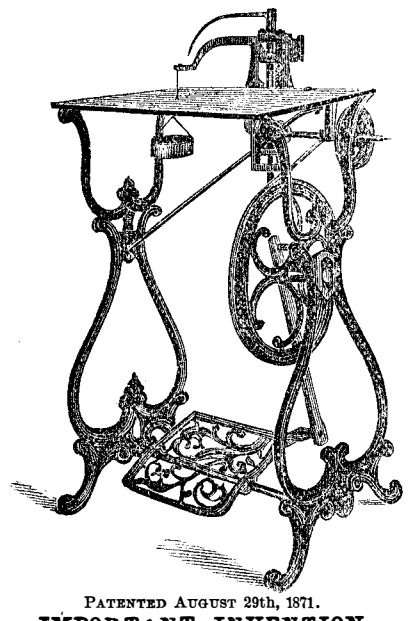

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TO THE PUBLIC.

The NORTH-WESTERN (BABCOCK) FIRE EXTINGUISHER COMPANY having brought suit against the PHILADELPHIA (GARDNER) FIRE EXTINGUISHER COMPANY, for alleged infringement of the Carlier and Vignon Patent (dated April 13th, 1869), which the said Babcock Company professes to own, in the use of water impregnated with Carbonic Acid Gas as a means to extinguish fires, we desire to make the following statements, *all of which we are prepared fully to substantiate by proof:*

First. The so-called Carlier and Vignon Patent is invalid for want of novelty, in that a patent was sued to W. H. Phillips, in England, in 1844, and in this country in 1850, for a Fire Extinguisher, in which water impregnated with Carbonic Acid Gas was used as the extinguishing agent.

Second. The said so-called Carlier and Vignon Patent has no legal existence, no legal application ever having been made for it to the Patent Office; and its issuance therefrom was accomplished by gross fraud.

Third. The lawyers conducting this suit against us brought suit *for the same clients on the same Patent,* against one Duryea, in the U. S. Court in New York, 1870, and the answer of Duryea being filed, setting forth the facts herein alluded to, *said suit was dismissed at the cost of the plaintiffs.*

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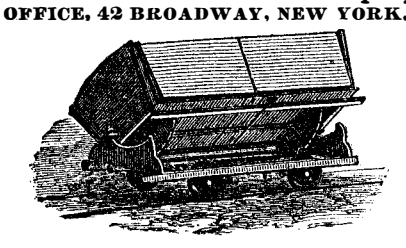

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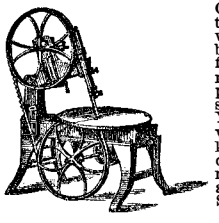

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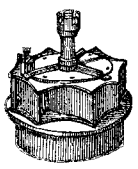

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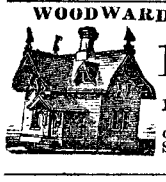

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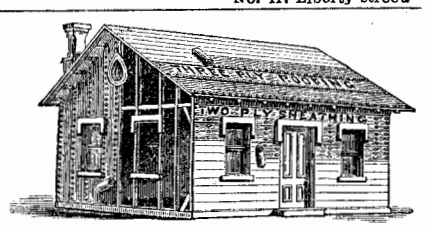

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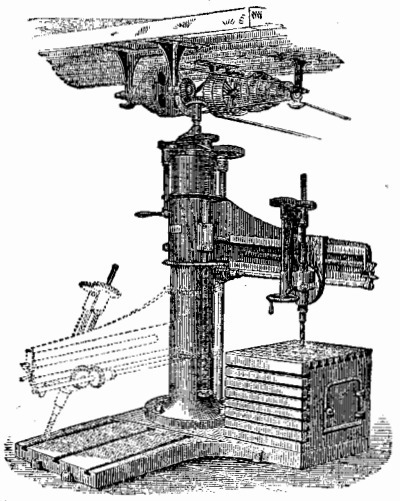

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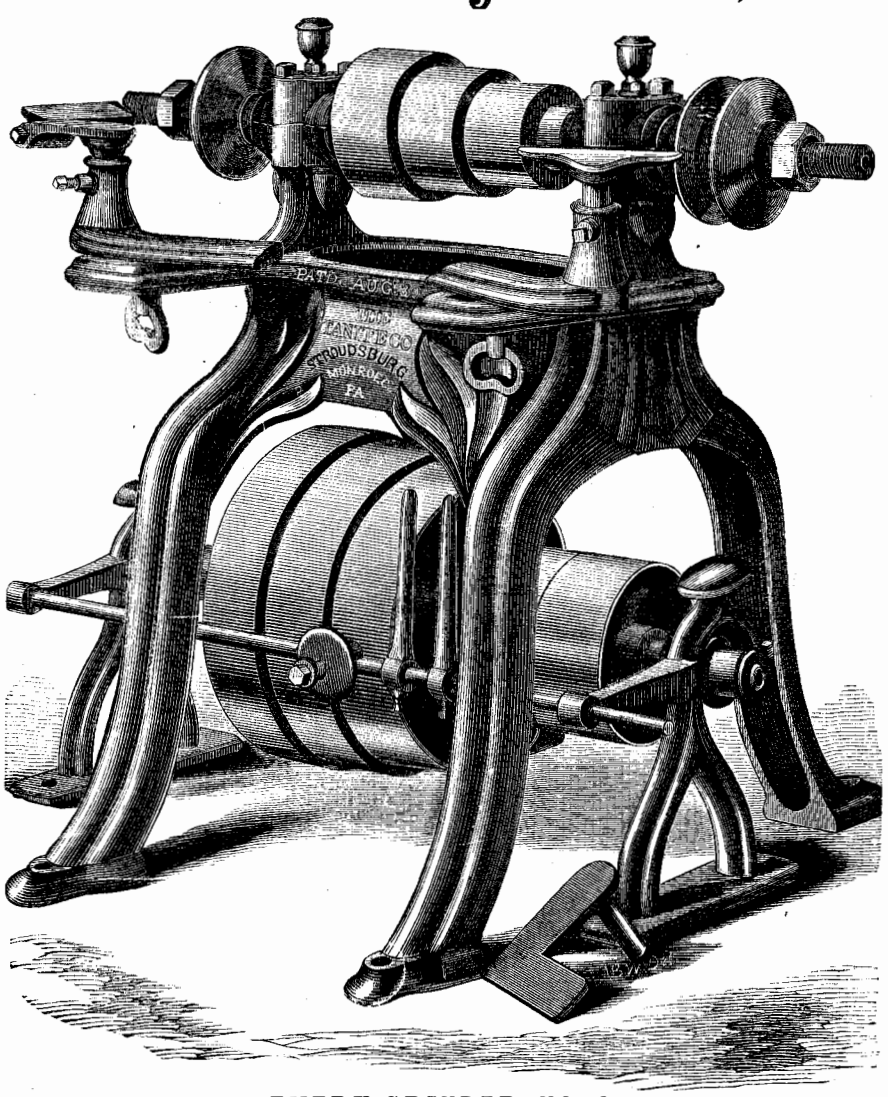

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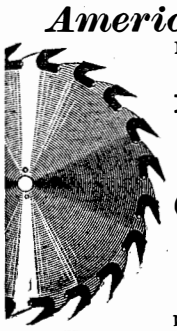

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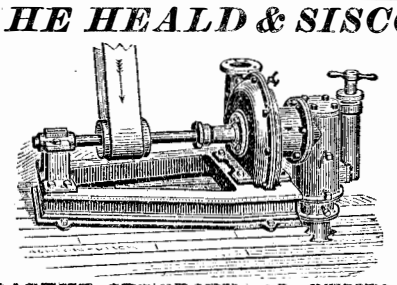

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